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ABSTRACT

Intended for parents of cerebral palsied children, the manual discusses special communication problems that often accompany the condition, and describes various strategies for helping such children communicate. A chapter on positioning for speech diagrams 14 different positions to help facilitate better functioning in many areas, including speech. A chapter on feeding therapy describes some of the ways to provide oral sensory experiences and to facilitate normal oral patterns of movement in a cerebral palsied person. Aspects covered include positioning, drinking, self-feeding, swallowing, and speech. A chapter on helping the child with both cerebral palsy and hearing impairment to communicate covers the detection, testing, and habilitation of such children. Another chapter examines the relationship between breathing and speech so that parents may better understand some of their child's possible difficulties. Specific guidelines are given to assist parents in assessing their child's abilities. In some instances suggestions for corrective steps are given. A chapter on nonverbal communication presents an overview of some alternatives to speech, including communication boards, communication books and other portable devices, and symbols for expressing information via nonverbal systems. A description of a child's normal development from birth to 1 year, with respect to communication, is appended. (DLS)

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CEREBRAL PALSY AND COMMUNICATION --

WHAT PARENTS CAN DO

Edited by Arlene Golbin

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Without the concern of parents, guardians and others on how to more effectively communicate with their developmentally disabled children and charges, this manual would not have been conceived. We sincerely thank those who sought this assistance, for calling to our attention what they felt to be the greatest problem in serving developmentally disabled persons of Region III. We humbly hope that this manual will provide them with some means of effecting better communication. Certainly, effective communication with others is the basis for full development socially, mentally, emotionally and vocationally.

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and

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Introduction

CEREBRAL PALSY AND COMMUNICATION--WHAT PARENTS CAN DO

by Arlene Golbin, C.C.C.

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INTRODUCTION

CEREBRAL PALSY AND COMMUNICATION--WHAT PARENTS CAN DO

Not all children with cerebral palsy have difficulty learning to speak. For those who do, the speech problems may range from mild to profound, may stem from different inabilities, and may sound and look very different. There are some who may never learn to speak. It is hoped that this manual will clarify the nature and extent of some of these problems and will also suggest some ways in which they may be alleviated or alternatives found. Much of the information deals with speech and the acquisition of the skills necessary to speak. Also presented, however, are some ideas for making communication possible for the child who does not yet, or may never, talk. These include such methods as adapting sign language, the communication system more commonly associated with the deaf, and using different types of communication boards. These may be very simple to rather complex devices which utilize pictures, letters, or other symbols. Some are activated electronically while others require some type of pointing ability.

The authors urge that all parents of children with cerebral palsy involve those professionals who may aid in the differential diagnosis and treatment of their child. These may include physical and occupational therapists, speech and language pathologists, and audiologists, as well as physicians. Happily, it is becoming increasingly common that these disciplines are working together as a team. When faced with the problems of cerebral palsied children, we realize that the *whole* child must be treated at all times. When investigating the development of speech and language skills we soon find that we are actually dealing with the child as a whole, his body and limbs, his social, emotional, and mental development. We also discover that very early intervention is of great importance. From birth, each normal stage of development prepares the way for the next. Thus, any abnormalities which are also present at or near birth may begin to delay or to change the developmental process (from its normal course). Normal development is the basis of comparison which makes such delays and deviances identifiable. Appendix , "Normal Development--Birth to One Year," is included as a quick reference for this reason. The earlier that any problems are detected and acted upon, the less time they have to become any more complex or severe. Thus, do not feel that, since the normal baby does not begin to speak until approximately 12 months of age, there are not habilitative steps which should be taken in the home long before the infant with cerebral palsy reaches that age. As is explained in subsequent chapters, good speech is based on the establishment of good learning, eating, and breathing patterns which are forming long before the appearance of those first words.

What is Cerebral Palsy?

Simply defined, cerebral palsy is a disability caused by damage to the motor centers of the brain occurring at or near the time of birth. The motor centers produce and control the body's movements. Because the damage is to the central nervous system, which controls the muscles, but not directly to the muscles themselves, it is a neurological and *not* a muscular disability. The damage causes two general types of dysfunction. The first is the loss of control over movement. The brain may not be able to send out the appropriate signals to activate muscle groups in a controlled and coordinated way. The second concerns the receiving of incoming messages. The brain may not accurately receive and process those sensations coming in. These sensations may include information about the positions and movements of the body and limbs. In some cases, sensations detected by the special sense organs, those of taste, smell, sound, or sight may also be affected. The specific nature and the extent of the difficulty varies with the exact location and extent of the brain damage. The symptoms of the damage may be thought of as either "positive" or "negative" (Jackson, 1958). The positive symptoms reflect all involuntary and undesirable activity. A bite reflex triggered by a spoon in the mouth or head jerking triggered by an attempt to speak are examples of positive symptoms. The negative symptoms reflect all loss or defect of a desired function. Not being able to chew or not being able to lift a limb when so desired are examples of negative symptoms.

Different symptoms are associated with the different types of cerebral palsy. These were classified by Wyllie (Wyllie, 1951) into five main types: 1) spasticity, 2) flaccidity, 3) athetosis, 4) ataxia, and 5) mixed. Spasticity is an increase in muscle tone, or *hyper*tonia. This means that there is an increase in the normal tension of a muscle, resulting in a continuous resistance to stretching. Flaccidity can be thought of as the opposite. The muscle is *hypo*tonic, that is, "weak" or "lax." The effect is a "floppy" baby. Athetosis is from the Greek "athetos," meaning "not fixed." This condition is marked by slow, sinuous, writhing movements as the muscle tone alternates from too high to too low. Research has demonstrated that athetoids, as a group, have the poorest speech intelligibility. Ataxia stems from damage to the part of the brain responsible for balance and coordination, the cerebellum. "Mixed" cerebral palsy is exactly that which its name implies, a mixture of any of the other four types. This, and not a "pure" form, is what is most frequently observed.

Other terms which are frequently seen in the description of persons with cerebral palsy are those which describe the distribution of the abnormal muscle tone throughout the body. Thus, a *mono*plegic is spastic or athetoid in one limb, a *hemi*plegic is involved in one whole side of the body, a *para*plegic is involved in both legs, a *di*plegic has either both legs or both arms affected, and a *quadra*plegic is involved in all four limbs (also called *tetra*plegic).

In any discussion of cerebral palsy reference is often made to "reflexes." A reflex is an automatic and involuntary activity. It is present when less complex, more automatic centers of the central nervous system are not controlled or inhibited by the most complex and least automatic centers of the central nervous system (Mysak, 1968). Think of the "knee-jerk" in response to a tap in the right place, the gag caused by a spoon handle placed down the throat, or the startle induced by a sudden loud noise in a quiet room. Obviously, there are some reflexes which remain with us our entire lives and are protective and desirable. Other

reflexes, however, which normally appear soon after birth and are desirable for a short time, should soon begin to weaken and disappear. These reflexes pre-determine the positions and movements of the infant. But as they come under control of, or are inhibited by, higher brain centers, the baby gains voluntary control of his movements. This allows for the emergence of new and complex skills such as rolling, sitting, chewing, and eventually walking and talking. Reflexes may thus be a problem if, 1) they are desirable for either a short period or entire lifetime, but never appear or 2) if they are normally inhibited at an early age but continue to persist. For example, the newborn who does not develop a suckle-swallow reflex may not be able to get sufficient nourishment, while the older baby, whose suckle-swallow reflex is not inhibited, will find it interfering with the more complex tongue and chewing movements which are necessary for eating solid foods. Both occurrences may be caused by brain damage and are, in fact, symptomatic of such damage. A thorough evaluation of the child with cerebral palsy must include a determination of which reflexes may require stimulation or elicitation, and which may require inhibition. The therapist may then recommend certain activities and positioning for the parents to carry out in the home, while discouraging others. Often, such decisions are difficult and "trade-offs" may be required. Many children with cerebral palsy learn how to put their reflexes to work for them. For example, the asymetrical tonic neck reflex (A.T.N.R.), which is present from birth and should be inhibited between four months to one year, produces mandatory straightening of the arm and leg of the side to which the face is turned, and mandatory bending of the limbs on the side from which the face is turned away. The child may learn to use this reflex whenever wishing to straighten an arm to reach a desired object or to bend the arm to pull the object nearer. Such behavior, unfortunately, strengthens the reflex which the therapist wishes to inhibit. The earlier such habits are "short-circuited" and new movement patterns are physically imposed over the reflex patterns, the better the chance that more normal movement will emerge.

Cerebral palsy may or may not be accompanied by mental retardation depending, once again, upon the site and the extent of the brain damage. Some persons with cerebral palsy are exceptionally bright, some are average, and some are of below average intelligence. Naturally, greater innate intelligence improves the prognosis for the mastering of new skills, including those needed to communicate. Mental retardation, in addition to the cerebral palsy, diminishes the rate and extent of the acquisition of such skills. It is very difficult to accurately assess the I.Q. of many of these children. Often, standardized tests are of little value. This author knows several severely physically involved children, living in a residential facility for the retarded, and who are still acquiring basic communication skills.

Language Problems

Language delays and deviances are problems for many cerebral palsied children. Bloom (Bloom, 1975) identified three components of any language system as 1) content, 2) form, and 3) use. Content refers to the underlying ideas you wish to express; to that which you know. It is thought or "cognition." Form refers to the conventional rules which govern any language. These range from rules of pronounciation to rules of grammar and word order. They determine the ways in which sounds combine to form words and words combine to form sentences. Use refers to meaningful communicative interaction with others. It is combining form and content in a way that is socially functional and socially appropriate.

A deficiency in any one or any combination of the three areas constitutes a language delay or a language deviance. A delay exists when the development is following a normal sequence but is abnormally slow. A seven year old who has the language skills of a normal three year old has a language delay. A deviance exists when the language pattern is unlike that seen during any normal developmental stage.

Such problems may be caused by organic injury to the brain, may be emotional or psychological in origin, or may be due to a combination of organic and psychogenic factors. Mecham (Mecham, 1963) presented some language symptoms of central nervous system damage:

> *One child, for example, may have hearing acuity within normal range and yet not understand or respond to verbal symbols of communication. Another child may be able to understand language but unable to call forth from memory, or associate with a specific event or object, a given word; vocabulary development may be a most difficult hurdle for this child. Some children with brain injury may develop a rather abundant vocabulary, but are unable to organize in appropriate sequence to be wholly coherent... An example of this latter type problem is represented in the following verbatim recording*:*

Question	Answer (by female child age 7-1/2)
What sleeps?	*Bed*
What swims ?	*Swimming Pool*
What floats?	*Water*
What stings?	*Well stings is bites, when ya, and the, bite ya, your finger, when ya get bit by, ya have to put some stuff on it for the medicine on the hands and, the medicine can stop the healing from your feets when the ants goes by your feet and that goes by your feets and ants go away.*

This is an example of a language deviance as opposed to a delay.

There are many different types of language problems. They range in severity from almost undetectable to profoundly handicapping. They are generally present in the case of retardation, but may also exist independently of any other intellectual or physical handicap. The child with cerebral palsy has a high risk of having an impairment which may impede the language development process to some extent.

*from Knepflar, K.J., "Language Inhibition as a Therapy Technique with Brain Damaged Children." Paper presented at the 1960 ASHA Convention in Los Angeles.

These linguistic problems may exist *in addition to* the problems of muscular coordination which affect the mechanical speech processes. These processes include 1) breathing, 2) sound production or "phonation," and 3) movement of the lips, tongue, soft palate, and jaw, the "articulators." These all relate to the presence or absence of specific reflexes and to the overall muscle tone of the child's body and limbs.

Each child with cerebral palsy will have a special combination of communication needs and problems. These will change continuously as the child grows and develops. As parents and professionals work to meet these needs, they must always consider the whole child with a handicap, rather than merely the handicap itself.

Arlene Golbin, M.S., C.C.C.
Editor

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Chapter 1

POSITIONING FOR SPEECH

by Elizabeth C. High, O.T.R.

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POSITIONING FOR SPEECH

Elizabeth C. High, O.T.R.

The cerebral palsied person suffers from a difficulty in maintaining normal body and limb positions. The often contorted stances he acquires not only affect physical appearance, but also his functioning in many areas, including respiration, digestion, oral-motor control, speech, and hand use. For example, if a person is habitually in a *flexed* position (bent over, back rounded, head down) the chest is constricted, making breathing difficult and shallow as the lungs cannot be fully filled. Also, the person cannot see what is going on about him and his hands are not able to reach out for things. In contrast, if a person is in a *hyper-extended* position (back arched, legs stretched out and head thrown back) he is very tense, he probably spends his day on his back (which limits his environment), and he cannot chew or swallow well (not to mention engaging in any hand activities). These are extreme examples of non-functional positions, but they are very common among severely involved cerebral palsied persons. Such abnormal positioning also affects the production of speech.

The aim in positioning these persons is to get them in the most normal, comfortable position possible to maximize normal *muscle tone* and *body alignment*, and to facilitate optimal functioning. The child should be encouraged to learn to position himself, but if he is unable to do so, special positionings may need to be arranged. With good positioning, the cerebral palsied person will be able to function at his best. Proper positioning will also help to prevent the development of certain deformities. First, the person should be relaxed--he may need to learn to do this with conscious relaxation methods. Sometimes taking a deep breath and then letting it go or shaking out the arms will help. A good beginning position for an infant or small child is sitting in the mother's lap facing the mother (See Diagram 1). His back can be supported by a foam wedge, pillow or infant-seat as needed. To inhibit the abnormal extension pattern, the child's legs can be flexed at the hip and at the knee, and turned out to straddle his mother's lap. The upper body and arms can be controlled by grasping the upper arms at the shoulder and guiding the arms to a central position. Good eye contact and beginning communication can be established in this position. This is also a good position for feeding. In this position the handler gets a good feel for the general state of the muscle tone of the child and can help him to relax through proper support and more normal positioning.

DIAGRAM 1: LAP SITTING FACING MOTHER

An older child should have a secure and stable chair. His feet should rest on the floor or on a foot rest. It is not desirable to have the feet dangling without support. Arm rests should be provided and placed at an elbow height which is comfortable when the arms are bent and shoulders relaxed. He should sit back in his chair so that he sits on his bottom and not on the end of his spine. If he is unable to maintain this position, a seat belt can be attached to the back of the chair and secured around his hips (See Diagram 2).

DIAGRAM 2: SEAT BELT AT HIPS FOR SECURITY

Do not put the belt around the waist as he will slide under it. A belt at the hips gives him security and leaves him trunk freedom so that he can lean forward at the hips. His back should be straight. If his spine curves to one side, he may need support to help straighten it. At this point, you may need to look into special chairs, inserts or adaptations to correct posture and prevent deformities.

Slanting the seat to one side can force the person to lean in the opposite direction and correct a beginning *scoliosis*. More serious curvatures will need the pressure of a chair insert or molded seat. Serious scoliosis should be treated orthopedically, beginning at an early age, to prevent the development of a permanent deformity that can seriously affect the person's functioning for the rest of his life. If he is inclined to keep his arms held up and back, he may benefit from an addition to his chair that pushes on the sides of his upper arms and shoulders (See Diagram 3). This inhibits this abnormal position and forces his arms into a more functional one. The chin should be level, not jutting out or head tipped back.

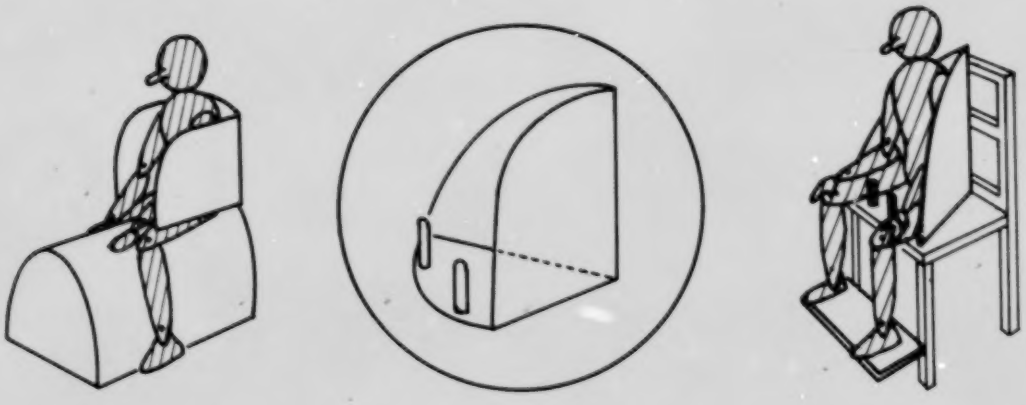

DIAGRAM 3: POSITIONING TO INHIBIT ABNORMAL ARM AND LEG POSTURES

A head rest may be necessary to assist in keeping the head forward (See Diagram 4 on next page). This should support the head at the base of the head. If placed higher, the head rest tends to encourage the *extensor thrust* pattern (leaning back).

DIAGRAM 4: HEAD REST ATTACHED TO CHAIR

This basic positioning is very important especially for feeding or using communication boards and other hand activities. When using a head stick to point to a communication board or to type, caution should be taken to place the work surface at a height and angle that makes it possible for the user to maintain good posture. The height of the table or chair may need to be adjusted (Diagram 5) or a stand provided to hold the communication board (Diagram 6).

DIAGRAM 5

DIAGRAM 6

USING A HEAD STICK POINTER. EITHER TABLE (DIAGRAM 5) OR WORK (DIAGRAM 6) CAN BE RAISED FOR GOOD HEAD POSITIONING.

While this is the best sitting position, the cerebral palsied person may be more relaxed by having constructed a chair or chair insert that has the back slanting back slightly and the seat wedged so that the hips are somewhat more flexed. These various positions that are being suggested are only examples. What is good for one person may not be good for another so that considerable thought should be given in arranging a new position to be sure it meets the needs of the person.

It must also be emphasized that no one should be kept in the same position for long periods of time. If the disabled person is not able to change his positions himself, the parent and/or other direct care persons should see that his position is changed about every 20 minutes.

Positioning on a mat may facilitate sound production--one such position is having the child lie on his side propped with bolsters, pillows and/or sandbags as needed to keep him from falling or returning to an abnormal position (See Diagram 7). The positions of these items (bolsters, etc.) may vary depending on the individual child. He will find inhalation easier on his back, propped by a foam wedge with a pillow or roll under the knees (Diagram 8).

DIAGRAM 7: SIDE LYING WITH BOLSTERS AND PILLOW. *Note: Bolsters Between Knees for Comfort.*

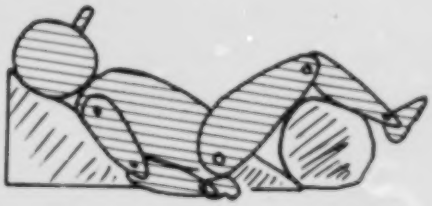

DIAGRAM 8: POSITIONING ON BACK WITH KNEES BENT, SUPPORTED BY WEDGE AND ROLL.

Another useful position can be lying on the stomach on a large wedge (Diagram 9) or *prone board*. This position will facilitate exhalation.

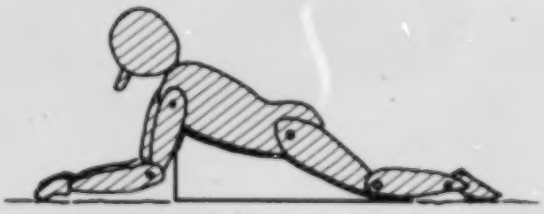

DIAGRAM 9: POSITIONING ON A WEDGE

Prone boards come in a variety of styles, many of which can be adjusted from approximately a 15 degree position to 90 degree, or upright position (Diagram 10).

DIAGRAM 10: ADJUSTABLE PRONE BOARD

Some prone boards have wheels and/or trays (Diagram 11), and others must be propped against a table (Diagram 12) or other surface.

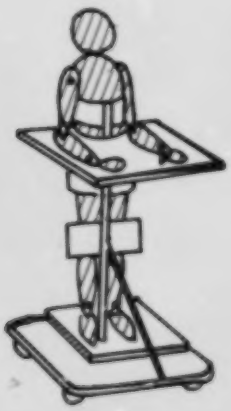

DIAGRAM 11: PRONE BOARD WITH WHEELS AND TRAY

DIAGRAM 12: EASILY CONSTRUCTED PRONE BOARD

Prone boards are useful for stabilizing a severely involved child or adult in a good anatomical position so that he can concentrate on his speech or hand use.

Other positions can be devised to facilitate speech according to the specific needs of the person. However, an unstable position can give the cerebral palsy person a sense of insecurity causing an increase in tension and involuntary motion which will also be evident in poorer speech and hand use. Also, a severely involved cerebral palsied person may suffer from considerable "overflow" (involuntary movements of limbs, facial muscles, neck, etc.) when attempting speech. If he grasps the edge of a table, chair seat, or bar placed specifically for this purpose, "overflow" will be decreased. However, opportunity for free movement should be given as well. Playing on a mat with the child in side-sitting (Diagram 13) or circle-sitting (Diagram 14) may aid in speech sound production as well. The therapist should keep in mind techniques for inhibiting abnormal reflexes and postures when considering a particular position and instruct the parents in the appropriate techniques.

DIAGRAM 13: SIDE SITTING

DIAGRAM 14: CIRCLE SITTING

When working with the severely disabled person who demonstrates little or no useful hand or arm function, the use of the toes and feet should be considered. Many such persons have developed the dexterity of their feet to a high level. They can learn to do many things that are normally done with the hands including non-oral communication techniques such as pointing at a communication board, writing, typing, and operating switches or buttons for sophisticated mechanical communication tools (See Diagram 15 on next page). Considerable experimentation may be needed to arrange the most comfortable, non-fatiguing positions for good foot use.

DIAGRAM 15: WHEELCHAIR ADAPTED FOR USING A COMMUNICATION BOARD WITH THE FEET

Determining the correct positioning of a severely disabled person is extremely important and should be guided by a team of professionals trained in this area, including an occupational therapist, physical therapist, rehabilitation designer, as well as the speech pathologist. For further guidance in this area you may wish to refer to some of the references at the end of this chapter.

GLOSSARY

1. *anatomical* - pertaining to the anatomy, or to the structure of the organism.
2. *body alignment* - body parts placed in correct or straight anatomical position.
3. *communication board* - a board with pictures, letters, and/or words used for conveying the user's thoughts.
4. *curvature* - a bending or sloping away, a curve.
5. *deformities* - body of limbs fixed in an abnormal position.
6. *exhalation* - process of letting out breath.
7. *extension* - straightening of any joint or part of body.
8. *extensor thrust, hyperextension* - extreme or excessive extension of a limb or part.
9. *eye contact* - interchanging of looks between persons wishing to communicate.
10. *facilitation* - making movement possible.
11. *flexed, flexion* - bending of any joint or part of the body.
12. *head stick* - a stick attached to some sort of head band used for pointing, typing, turning pages, etc.
13. *inhalation* - process of drawing in of breath.
14. *inhibiting abnormal reflexes* - a therapeutic technique used to stop abnormal movement.
15. *muscle tone* - the state of tension in the muscles at rest and when moving that maintains the body in good posture unconsciously.
16. *positioning* - arrangement of bodily parts.
17. *prone board* - an apparatus used to stabilize in an upright or semi-upright position a person who is unable to stand alone.
18. *scoliosis* - lateral curvature of the spine.

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EQUIPMENT SOURCES FOR SPECIAL POSITIONING

1.	Abbey Rents and Sells 13500 S. Figueroa St. Los Angeles, CA 90061	800/421-1170 (toll free) chairs, wedges, rolls, etc.
2.	Adaptive Therapeutic Systems, Inc. 36 Howe St. New Haven, CT 06510	chairs
3.	Contourpedic Corp. 28 Midland Ave. Saddle Brook, NJ 07662	chairs
4.	Everest and Jennings, Inc. 1803 Pontius Ave. Los Angeles, CA 90025	chairs
5.	Housmann Industries, Inc. 130 Union St. Northvale, NJ 07647	201/767-0255 tables, mats
6.	Kaye Products, Inc. 2819 Hillsborough Rd. Durham, NC 27705	prone frames, chairs, wedges
7.	Maddak, Inc. Industrial Rd. Pequannock, NJ 07440	chairs, etc.
8.	G.E. Miller, Inc. 484 South Broadway Yonkers, NY 10705	914/969-4036 chairs, prone boards, mats
9.	L. Mulholland and Associates 1563 Los Angeles Ave. Saticoy, CA 93003	805/647-5527 chairs, prone boards
10.	Ortho-Kinetics, Inc. 1225 Pearl St. Waukesha, WI 53186	chairs
11.	Palmco Engineering Co. 8416 Secura Way Santa Fe Springs, CA 90670	chairs

12. PENCOR
Industries Division
Bureau of Corrections
Box 231
Camp Hill, PA 17011

717/787-7486

chairs, prone boards, wedges, rolls, mats, etc.

13. J.A. Preston Corp.
1803 Pontius Ave.
Los Angeles, CA 90025

wedges, rolls, chairs, mats, etc.

14. Rehab Med
Rehabilitation Equipment, Inc.
1556 Third Ave.
New York, NY 10028

212/427-9595

chairs, prone stander

Chapter 2

FEEDING THERAPY AND SPEECH: SOME PROBLEMS OF ORAL MOTOR CONTROL

by Roberta Liebman, C.C.C.

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FEEDING THERAPY AND SPEECH: SOME PROBLEMS OF ORAL-MOTOR CONTROL

Roberta Liebman, M.A., C.C.C.

Cerebral palsied children often have difficulty using their mouths well. They may suck, drink, chew, or eat from a spoon poorly. They may drool. They may produce speech sounds inaccurately. If these problems are not treated early, they are likely to persist in later life.

Cerebral palsy is characterized by abnormal patterns of movement and tone, usually affecting large portions of the body. It is not surprising that the movements of the mouth and face are similarly affected, and that we see many problems in the control of the oral musculature among this population. You will have learned from physical therapists and others working with the cerebral palsied child that treatment usually emphasizes the facilitation of normal posture, tone and movements. Treatment of the stereotyped and abnormal movements of the oral musculature is similar. This chapter will describe some of the ways you can provide oral sensory experiences and can facilitate normal oral patterns of movement in a cerebral palsied person.

It is common to see cerebral palsied children open their mouths widely and extend their tongues in a *tongue thrust* when they lie flat on their backs on the floor. When they are held in a *flexed* position, their tongue and mouth postures change. Notice that the posture of the mouth is usually related to the posture of the whole body. To help the child use his mouth well, you must start by positioning his body in ways that help his mouth function normally.

Positioning

This chapter cannot provide the information and training necessary for assessing each child's needs for proper positioning. You will need to consult the physical therapist and physician working with the child. Until you are able to do so, you may want to refer to the drawings in Handling the Young Cerebral Palsied Child at Home by Nancie Finnie. When holding or seating a cerebral palsied person for feeding, it is important to ensure that his body is symmetrical, his hips are flexed, and his neck is slightly flexed too. His head should be in the *midline* (See Diagram 16 on next page).

DIAGRAM 16: GOOD SITTING POSITION FOR MEALS. FEET ARE ON THE FLOOR, HIPS ARE FLEXED, HEAD IS FORWARD.

If a child is able to sit up, he should sit firmly on his bottom, not on the end of his spine. His chair should have a foot rest if his feet do not rest firmly on the floor. Semi-reclining is a good position for children who lack trunk stability. No child, however impaired, should be fed flat in a bed or held with his head as low as the rest of his body. This position makes swallowing unpleasant and makes the improvement of oral skills impossible.

When you feed the child, it is a good idea to remove as much of his clothing as possible so that you can see that he remains properly positioned throughout the meal. An older person may prefer to wear a smock. From time to time, remember to look under the smock at the position of his body. Throughout the meal, the head should be in the midline, not tilted off to one side. Be especially sure that the head is not extended back, but is in a comfortable slightly flexed position like yours is when you eat.

One way to help the child maintain a good position is to position yourself carefully in front of him. Place yourself at his eye level or slightly below. If your eye level is higher than his, he will tip his head back to look up at you. At the same time, he may open his mouth, extend his tongue, or pull his top lip back. These patterns interfere with good eating. If you place a small child's feeding chair on top of a table at which you are seated, or if you sit on the floor in front of his chair, your face will be at about the right level.

Food Texture

During the first year of life most children are offered liquids from a cup and solid food from a spoon. Sometimes cerebral palsied children are not given these foods because they resist new foods or seem to gag easily on them. It is usually a poor idea to delay the introduction of more mature foods for too long. For one thing, the child may become increasingly resistant. After years

of the bottle, the cup will feel very strange to him. Solid foods may make him choke and gag simply because he is unused to them. Secondly, many people now believe that the child gains a great deal of information from the varied tastes, textures and temperatures we introduce into his mouth. He probably first learns about space and direction in this way, too. We must be sure that the cerebral palsied child does not miss the wealth of early sensory stimulation and learning provided by the mouth.

Drinking

A good way to introduce cup drinking to the child is with a soft plastic cup from which you have cut out a section (Diagram 17).

DIAGRAM 17: SOFT PLASTIC CUP IS CUT OUT SO THAT THE CHILD'S HEAD IS NOT TILTED BACK FOR DRINKING

The cut-out permits you to look into the cup to see how the child is doing. More important, the cut-out leaves room for the child's nose, so that you can tip the cup, not the child, to get the liquid at the bottom of the cup.

Using a soft plastic cup is important because some children clamp their teeth down tightly on the edge of the cup. Others make repetitive biting movements, opening and closing their jaws over and over, when they try to drink. In either case, you can see it is unwise to use glass or brittle plastic cups or spoons when feeding a cerebral palsied child. Even styrofoam cups can crumble and choke the child. It is also unwise to use a plastic spout cup, as this shape encourages the child to use a sucking pattern, not real drinking.

Even when the child's head and body are positioned well, you may find that he cannot close his mouth around the cup. Many cerebral palsied persons need help with *jaw control*. The person feeding them needs to provide manual assistance in keeping the tongue inside the mouth and in closing the jaw. This can be done in either of two ways.

The first way is to place your third finger flat on the muscle under the child's chin (See Diagram 18 on next page). Pressing upward helps close the jaw and helps control the tongue by applying pressure at its base. Stabilize your hand by placing your index finger flat against the cheek. With the thumb on the

bottom lip, close the lips around the cup. You may use whichever hand feels most comfortable to you. The other hand, of course, holds the cup. Notice that you are helping the child close the lower jaw and lip, but that you are not applying any pressure on the upper lip. Once your hand is in position for jaw control, try to keep it in contact with the child's face while he takes several sips. Do not remove your hand or the cup between sips. Do not wipe up spills until he has finished drinking. Some children need help of this kind for many months. Others can maintain the position independently as you gradually reduce your manual control.

DIAGRAM 18: JAW CONTROL SUPPLIED BY AN ADULT SEATED IN FRONT OF THE CHILD. EYE CONTACT IS MAINTAINED.

Jaw Control

There is a second, more powerful method of jaw control which is useful with an older person or a child with a very strong tongue or jaw thrust (see Diagram 19 on next page). Run your arm around the back of the child's neck, using your shoulder, if necessary, to flex the head forward. Then, place your third finger under his chin, your index finger on the lower lip, and stabilize your hand with your thumb along the side of the face. You will notice that this position places you somewhat behind the child, and you have lost eye contact with him. This is not a sociable position, but you may have to use it for a while until the front position described above works for you and the child.

Whichever position you use for jaw control, you will want to be sure your finger nails are short enough to avoid any discomfort to the child. Be careful that the finger of thumb lying along the child's cheeks does not poke his eye or press on his temple. Practice this new position on another adult until you feel comfortable with it. When you introduce it to the child you do not want to

DIAGRAM 19: JAW CONTROL SUPPLIED BY AN ADULT SEATED BEHIND OR BESIDE THE CHILD.

communicate discomfort to him. You want him to feel relaxed and secure in all his new eating experiences.

Drinking from a straw is a more complex skill than drinking from a cup. It should not be introduced until the child has developed good eating and drinking patterns. If a straw is introduced early, the child is likely to hold it far back in his mouth and to use his tongue in a thrusting pattern. True straw drinking is accomplished with the straw held between the lips only.

Many cerebral palsied children need help eating from a spoon. When you bring the spoon to their mouths, they open widely and push their tongues forward. They do not close their lips around the spoon. The adult usually scrapes the food off on the child's top gums or teeth. Once the food is in the child's mouth, his strong tongue thrust may simply push it out again.

You must help the child use his lips to remove the food from the spoon and move the food back in his mouth for swallowing. Check to be sure that he is positioned well. Then offer a spoonful of food. Instead of scraping it off on his top teeth, let the child feel the weight of the spoon as it rests on his tongue. Wait a few seconds for his lips to close around the spoon. Then remove it. The child will have taken an active part in the eating process. You may notice that when the food has been acquired in this way, the child pushes it out less than before. If tongue thrusting is still a problem, you can control it a little by using the front jaw control method described for drinking. You can also reduce the strength of the thrust by limiting the wide mouth opening when you first introduce the spoon.

If you watch yourself in the mirror when you are eating, you will see that you do not open your mouth wide for each mouthful. The cerebral palsied child often does, and that seems to set the scene for the strong tongue thrust that follows. When you bring the spoon toward the child, use your other hand to limit the width of his opening. Of course, you never want to tell the child to *open*

wide. He only needs to take a little bite.

The flavor and texture of food seems to make a big difference in the way some children manage their food. Foods that are very soupy have a tendency to slip away from the child. They run forward, or they slide down his throat before he is ready to swallow them. Many children do better with foods that are thicker than you would expect them to like. Perhaps the heavier foods give a stronger sensory input. Yogurt, for example, may stimulate a great deal of tongue thrusting. If it is thickened with instant cereal, the child may keep it within his mouth and swallow it.

The foods that are the most difficult for cerebral palsied persons to eat are those that combine different textures. Junior baby foods with whole peas, chicken soup with bits of carrot, and jello with chunks of fruit require complex manipulations of the tongue. It is better to leave these foods for a later time, or to pick out the lumpy parts, offer them separately, and then feed the soupy parts.

As with the cup, some children clamp down tightly on the spoon. You can protect their teeth and gums by using a latex covered spoon. These are often sold among baby supplies in drug stores and supermarkets.

Finger Foods

Some of our most delicious and nutritious foods are eaten with fingers or forks. Unfortunately, many cerebral palsied persons have no opportunity to enjoy them because they have not learned to chew. It is important to introduce crunchy foods to a cerebral palsied child early, so that he learns to use his gums and teeth on them, and so that he can widen his experience with varied flavors, textures, and smells. Most people start by offering crackers and cookies. The child can bite these, but he does not really have to chew them. After a few minutes in his mouth, they dissolve in his saliva and are easily swallowed. Bits of dry cereal can also be fed in this way.

After introducing foods like crackers, you will want to offer the child cubes of meat and chicken, vegetables like cooked carrots and stringbeans, and fresh fruits like pears, apples and watermelon. Canned fruits are too slippery for the child to chew well. Sandwiches can also be given, but you will find that most children are unable to chew commercial white bread. It becomes gummy and lodges in the child's high-arched palate. It is helpful to use firm breads such as whole-wheat, rye or oatmeal bread. Toasting the sandwich makes it crunchy and easier to chew.

Start by placing bite-sized pieces of food on the child's molars or gums. If he opens his mouth very wide, use your hand to limit the size of the opening. Take care to vary the side on which you place the food so that the child gets experience chewing on both sides of his mouth.

To elicit chewing, rub the inside and outside of the child's cheeks in a circular movement. Sometimes it helps to prepare the child for mealtime by doing this with a piece of terry cloth wrapped around your fingers. The rough cloth seems to give extra stimulation. If the child is extremely resistant to your

attempts to help him chew, it is a good idea to have a dentist check his teeth and gums for possible sources of pain.

Once food has been placed on the molars, stimulate chewing by rubbing the outer side of the teeth and gums with your fingers. Because many cerebral palsied children have strong bite reflexes, you must take care not to let your fingers slip between the teeth. Even a child who cannot chew may bite unintentionally. If you do feel the child bite down, remain calm and ease him into releasing. Excitement will only make it harder for him to release. Biting of this sort is not intentional or bad behavior. It is part of an involuntary pattern, like the rest of the cerebral palsy patterns.

In the beginning, you will see that the child's chewing is a simplified version of what you do. He does not really move the food around in his mouth, but only chews up and down a few times and then swallows it directly. Later on you will be watching for him to use his tongue to push the food back onto his teeth when it slips off and to move his jaw in a rotary chew. These skills develop with experience and with help from you.

Suggestions

The help you provide comes in a number of ways. First, you are careful to see that the child is positioned in ways that are proper and comfortable for him. Second, you do not give him many verbal directions for eating, and do not make him feel that he should try hard to eat in a particular way. Most children show increasingly abnormal patterns when they actively try to improve their eating. You are helping by providing the position, control and foods that help him eat as well as he can. As the child progresses in oral skills, you will reduce the amount of manual control you provide. This approach will require a great deal of observation and care on your part, but for the child the process is natural and involuntary.

Feeding children is always a messy process. When you feed a cerebral palsied child you need to forget about mess and spills as much as possible. You can clean those up at the end of the meal. Do not keep wiping the child's face when he is trying to drink or chew. At the end of the meal, wipe his mouth in a way that helps him maintain a symmetrical, closed-mouth posture. Stay at eye level. Stabilize his head with a firm hand on the top of his head. Use a wet towel or cloth to blot the child's mouth, using movements all around the mouth that bring the lips and jaws toward closure.

Self-Feeding

In this discussion of eating, we have emphasized how you feed the cerebral palsied person, not how he feeds himself. The child who is feeding himself may resist your interventions with his eating patterns. It may be wise to delay self-feeding until you feel that good drinking, chewing and removal of food from a spoon have been established. When these patterns are automatic, and when the child is able to use his hands in the midline position, he will be ready to master hand-to-mouth patterns for food and utensils. Similarly, it is wise to delay straw drinking for young children until good oral control has been achieved, although you may, for social and nutritional reasons, need to help an older person use a straw even though his drinking patterns are abnormal.

Feeding a cerebral palsied child properly sounds like it takes a lot of extra time. At first, it might take extra time, especially if the child has habitually eaten like a bird, with his head thrown back and the baby food slipped in. Most people find, however, that feeding therapy eventually results in happier and speedier mealtimes.

Goals

By establishing good eating and drinking patterns in young children, you are assisting the development of good physical, social and emotional health patterns. You are helping the development of basic communication skills that normally emerge first between parent or caregiver and child. In the intimate contact of mealtime, the adult and child exchange eye contact, sounds and gestures, all of which are essential to what we call *communication*. The adult, pleased in providing nourishment and satisfaction for the child, conveys, in a multitude of verbal and non-verbal ways, that caring for the child is a pleasurable job. The child, responsive to these cues, learns to love and trust the adult. If this process is disrupted by three stressful mealtimes a day, the relationship upon which communication is built can be profoundly disrupted. Feeding therapy, by assisting the child to gain control of his oral musculature and by maintaining his motivation speak, is truly pre-speech therapy.

It is important to remember, too, that many cerebral palsied persons will continue to need help with eating throughout their lives. The pleasure they derive from eating and the willingness with which others help them eat will depend largely on their skill in eating and drinking the foods of a normal diet. You are using your time well when you help a cerebral palsied person develop good eating patterns.

Sensory Stimulation

Throughout the day you can provide sensory stimulation that helps the child increase his awareness of the differentiated parts of his face and mouth. Try to include this oral stimulation in your daily play and handling of the child. The child does not have to be consciously involved in this work. Often his attention can be focused on a toy in his lap while your hands are on his face and mouth. If a child is exceedingly sensitive to touch and handling in the oral area, you may discover that he has had severe difficulties grasping toys and bringing things to his mouth. His early development therefore never included the exploratory mouthing that the young child normally does. As we mentioned in connection with eating, the child learns a great deal through his mouth in the early years. He learns about his own mouth as he puts things into it. He learns to sense differences between front and back, open and closed. At the same time, he learns to tolerate a variety of feelings within his mouth. The toys he puts in are different in texture, shape and temperature from his tongue, teeth and gums. Even his hands and fingers provide different sensations of taste and movement. If you help him explore with his mouth, the child who has never had these experiences may increase his awareness of oral differentiation and his tolerance for varied food sensations. You can help him put his fingers in his own mouth by running them over lips, teeth and tongue. Help him bring a doll to his face for hugging and kissing. Place him on his stomach or side so that in playing he brings toys to his face and mouth.

If the child seems to be hyper-sensitive to your hands on his face at mealtime, you will certainly want to help him become accustomed to them at other times of the day. If he dislikes your hands near his mouth, start by placing them on his chest, or near his hair. Work your way down towards his mouth and chin. Use a firm touch. Never tickle or poke the child's face. Once you have put your hands on his face, slide them firmly toward his mouth. Each time you remove your hands and put them back again, he must grow accustomed to the feeling again. If you leave them on his face, he is likely to feel it is a continuous sensation. With your fingers on the outside, slip your thumb inside the mouth and rub the child's gums and the inside of his cheeks.

A good way to provide for oral stimulation and for hygiene simultaneously is with daily tooth brushing. Use a small soft brush that allows you to brush the teeth and gums. To help the child discriminate the separate parts of his mouth, brush only one quarter of the mouth at a time. Allow time after brushing each section for tooth paste to drain out and for the child to close his mouth and swallow. Then move to the next quarter. You can also brush lightly on the side of the tongue to stimulate movement toward the side brushed.

Swallowing

Throughout the day you can help the cerebral palsied child close his jaw and lips. Your hand position will be the same as for jaw control for drinking. Stimulate the gums, too. First, rub your forefinger firmly on the gums of one quarter of the mouth. Then help the child close his teeth and lips. Hold his mouth in the closed position until you feel him swallow the saliva that has collected. After stimulating each section of the mouth, close the jaw and lips and wait for the person to swallow automatically. With this kind of stimulation you help the person differentiate the parts of the mouth. He experiences the tongue within a closed mouth, in the position from which he swallows correctly. At the same time he learns to control the saliva as it gathers within the mouth. This approach teaches a person to sense the saliva pooling within the mouth and to deal with it before he has actually drooled. If you concentrate the person's attention on the wet chin or on the wet book below him, you are asking him to deal with saliva that has passed beyond his control. It is preferable to develop awareness of the saliva before it has left the mouth.

One way to help the person close and swallow throughout the day is to place your index finger horizontally across the upper lip, just below the nose. The pressure of your finger must be rather firm. The response is usually an automatic closing and swallow. Stroking upward on the bottom lip a few times may have a similar effect.

If you are concerned about helping a person learn to control his saliva, you will want to begin work at times when you can position him well and when you can limit his activities. Many people, who do not drool when seated quietly, lose control when they try to move about or use their hands. After the basic oral control pattern has been established, you can work to integrate fine oral control with other activities.

Speech

When you are talking with a cerebral palsied person, keep in mind the

factors you consider at feeding time. Be sure he is positioned in a way that facilitates normal movements and tone. Look for body symmetry. A head that is tipped to one side is often reflected in distortions throughout the face and mouth. It is particularly important to position yourself at eye level so that the person does not hyper-extend his body and tongue. This would impair his vocal quality and his articulatory control.

Keep in mind that your goal for the cerebral palsied person in an easy flow of speech, not the effortful production of a few correct sounds. Work at all times for chains of sound or syllables of extended duration. Singing, repetitious phrases and sing-song utterances are all helpful in keeping the speech sounds flowing.

You can draw a child's attention to sounds like (mamama) by producing the sound yourself while guiding his lips and jaws into the alternating closed and open positions required. Let him feel the lip contact in the closed (mmm) position. If the child has a strong jaw thrust, he may extend widely when he moves into the open position for (a). This will change the quality of the sound he produces and will make it difficult for him to move smoothly back into position for (mmm). In this case, limit the excursions of his jaw with your hands. As with all types of oral control, reduce the smount of control you supply as the child's movements become refined.

You might work on (bababa) and (papapa) in the same way, as the lip closure is similar for all three bi-labial sounds. However, the child may explode a great deal of air with the first (b) or (p), and then stop the chain of sound. It may help to use the plosive sound in the medial position as (apapa), or you can emphasize a word like *baby*, making it into a rhythmic, sing-song word. Perhaps the child will imitate with (baybay). If he persists in producing a single explosive sound, switch to another sound at this time. The sounds (k) and (g), when incorporated into syllables such as (kukuku), which later develops into *cooky*, can be stimulated by laying your fingers flat under the child's chin, at the base of the tongue, as you say the sound yourself. The bottom lip can be manipulated into position for syllables containing (f) and (v).

The production of varied vowel sounds helps increase the intelligibility of speech. In addition to the (uh) vowel he probably uses, the cerebral palsied person needs to develop sounds like (ah), (oo), (oh) and (ee). Many of these sounds can be incorporated into animal sounds and exclamatory sounds which lend themselves to repetitive production. As you produce the sounds and encourage the child's imitation, you will again become aware of the need for graded mouth openings in the production of speech. Use your hands to mold and shape the mouth opening while you produce the sound yourself. The child should occasionally place his hands on your mouth to feel its shaping. At other times lay the child's hands on his own mouth, guiding them so he feels its movement and shape.

During this speech play, the child should sense your acceptance of all his speech efforts. You are pleased when he vocalizes and when he attempts to copy your productions. You will not be concerned about correcting the accuracy of his sounds until he is speaking a great deal. Later on, he may need help in refining his articulation, but the early stages of speech sound development should not include correction. The model you provide in producing the sound for the

child to see, hear and feel is adequate at this time.

It is tempting to think that if a child does not produce tongue tip sounds like (t), (d), (n) and (l), we can encourage him to do so by stimulating his tongue with lollipops and sticky foods. These techniques can occasionally be useful, but they are not helpful to most cerebral palsied children because they tend to increase tongue thrusting. Similarly, blowing exercises tend to increase tone in a spastic child. Oral-motor problems are chiefly those of control, not of strength. Treatment must focus on patterns of movement, not on individual muscles. It is not productive to use any techniques that encourage the tongue to thrust forward or to emerge from the mouth. Concentrate on those patterns of movement that encourage the tongue to remain within the mouth and to reach up with the tip to the roof of the mouth.

The easy production of speech requires finely graded movements of the lips and tongue, especially of the tongue tip. As for eating and controlling saliva, these movements must come from a quiet, lightly closed mouth in which the tongue can move freely and independently of the jaw. When the mouth is open, the tongue is generally inactive, or stereotyped in its in-out movements. Within the mouth, the in-out movements are reduced and there is increased use of the tongue tip, especially against the teeth and gum ridge. By encouraging closed mouth posture throughout the day, you can help the cerebral palsied person develop an awareness of the pressure of one lip against another and a feeling for the movement of the tongue within the mouth. With the mouth closed, the mouth breather is also encouraged to develop the important pattern of nasal breathing. See Chapter 4, BREATHING AND SPEECH.

Many cerebral palsied children are seen with retracted upper lips. The lip has been little used when eating. The mouth has been open much of the time. There is increased tone in the lip. The result is a lip which appears too short to meet the bottom lip, and which feels tight when you try to manipulate it. You will want to consider increasing the function of this lip when you work on mouth closure with the child.

You can directly stroke the bottom lip upward toward closure, but you generally cannot do the same for the top lip. Direct attempts to move it downward result in the lip becoming tighter and tighter. It is better to work on the lip by stroking on the broad area from the ear, across the cheeks, toward the upper lip. Take care to maintain the child's facial symmetry as you do this. As you move your hands across his face, you will see the lip relaxing and moving downward. Sometimes it purses outward a bit. This is a good time to make an (oo) sound as in *shoe*. With the help of your hands, the child can produce the sound with you. The imitation of kissing can also be practiced.

Forced or reflexive smiling is often seen among cerebral palsied persons. It is a problem of oral-facial control and can become a problem of communication, because the inappropriate smile lends itself to misinterpretation. The person may show a wide open-mouthed smile in response to many stimuli, especially speech. Even the mention of pain may elicit the smile. If you help the person reduce forced smiling and establish a neutral expression in response to speech, he will be free to develop a range of truly expressive facial movements.

Begin by noticing how often you and others respond to the smile with a big smile of your own. This only reinforces it. Try to approach the person with a friendly but neutral expression. Save the smiles for the times when they are really appropriate. At mealtimes, talk quietly and do not expect the person to smile while eating. By moving your hands over the facial area toward the lips, help him relax his face and lips into a neutral expression. This is the base from which other expressions can develop. If the person is in the habit of using a smile as his *yes* response, encourage him to substitute the closed-mouth sound *mm-hmm*. By using this sound yourself when you are with him, you will provide an effective model for him.

Some cerebral palsied persons develop a pattern of hyper-extending their bodies and necks as they speak. This is an abnormal posture, detrimental to the free flow of speech. Your care in positioning the person well before encouraging him to converse will be helpful here. In addition, your reinforcement of a sustained flow of speech, rather than the production of a few loud or correct sounds, may prevent the problem from developing. It does seem, however, that in some individuals the change from quiet breathing to that required for speech is a trigger for hyper-extending. You will want to refer to the chapter in this book on respiration for help with this problem.

Persons with mild to moderate cerebral palsy often make good progress in the early acquisition of speech sounds. When speech output is close to normal in quantity, they may need your help in improving the precision and rate of their articulation. It is often helpful to reduce the complexity of language when working on such skills. Begin by using stereotyped phrases, imitated sentences and singing which allow the person to attend to the new skills he is learning. As rate and articulation improve, they can be integrated into functional phrases and sentences.

The production of speech is a complex process, requiring rapid and precise articulatory movements in integration with patterns of respiration and phonation. The moderately or severely involved person is likely to have difficulties with all of these processes. You will want to refer to other chapters of this book for help with them and for help with deficits like hearing loss which also retard the development of speech. For all children, you must consider language development and the wealth of direct experiences upon which it is based.

Despite our best efforts, severely impaired cerebral palsied persons sometimes do not succeed in developing oral motor control adequate for communication. They may be able to produce words and some phrases, but the length of their utterances and the precision of their articulation is insufficient for the extended conversation necessary to express their thoughts fully. It is imperative that such persons be helped to acquire an alternate form of communication. Some are able to use gestures and signs. Many prefer communication boards. Such non-vocal means of communication enhance the intelligibility of the person's limited speech. They reduce some of the frustration that builds as a result of blocked communication. Most important, they keep the cerebral palsied person in communicative contact with those around him. They permit him to interact with the world.

GLOSSARY

1. *flexed, flexion* - bent, bending (of any joint of the body).

2. *jaw control* - using your hands on the face of the child in such a way as to guide or control the movement of his jaw.

3. *head in midline, midline position* - lined up along the axis of an imaginery line running vertically up the center of the body.

4. *tongue thrust* - uncontrolled protrusion of the tongue.

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Chapter 3

HELPING THE CHILD WITH CEREBRAL PALSY AND HEARING IMPAIRMENT TO COMMUNICATE

by Diane Paul-Brown, C.C.C.

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HELPING THE CHILD WITH CEREBRAL PALSY AND HEARING IMPAIRMENT TO COMMUNICATE

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The incidence of hearing impairment is higher in the cerebral palsy population than in the general population (Fitch, 1972). The main avenue for acquiring speech and language is by hearing. Therefore, a hearing loss in any child severely affects the acquisition of these communication skills (Hardy, 1961). For a child with cerebral palsy, the problem is even greater. Therefore, a parent or other person working with a child with cerebral palsy must be aware that a hearing loss may exist, and must know what to do for the child. The purpose of this chapter is to help you, the caretaker of a child with cerebral palsy, in the detection, testing, and habilitation of a child further affected with a hearing impairment.

How to detect a hearing loss

Since there is a higher percentage of hearing loss in children with cerebral palsy, you should be on the alert early in your child's life. The incidence of hearing loss is greatest in the athetoid population, especially in those children where RH incompatibility was the cause of the handicap (Fitch, 1972). Consequently, if your child is so diagnosed, you should be even more suspicious of possible hearing loss. As a further indication, athetoids with hearing loss seem to have more involvement in the head and neck area (Keats, 1965). In addition, children with cerebral palsy are more susceptible to childhood diseases such as measles, mumps, encephalitis or meningitis, which may produce a hearing loss by creating a high fever or lack of oxygen (Nober, 1966). You should observe your child's reaction to ordinary sounds by checking at least every few weeks during the child's first six months, and about once a month thereafter through childhood, in addition to daily casual observations (Cardwell, 1956). The detection of hearing loss in a child with cerebral palsy is not an easy task. You may notice responses to certain noises, like hand clapping or keys being dropped on a table. However, these responses may be reactions to feeling the vibrations rather than hearing the sounds (Hardy, 1953). If physically unable to turn her or his whole head, your child may look in the direction of sounds with eyes only. This may mean, though, that your child sees somebody else looking in the direction of the sound, rather than actually hearing the sound. Furthermore, you may think your child, who is babbling, is hearing sounds. Even children who are deaf, however, babble until about seven months, as do nonhandicapped children (Looney, 1976). However, the deaf children's babbling sounds are not modified to match the sounds produced around them, and after seven months, when nonhandicapped children

continue to vocalize, deaf children usually cease (Looney, 1976).

It is not always clear if the signs which alert you to hearing loss are the result of motor involvement or hearing impairment (Fisch, 1955). From birth, nonhandicapped children respond to loud noises which are near. Within two months, these same children attend to the human voice (Cardwell, 1956), and within about three to six months can turn their heads to the source of a sound (Cox & Lloyd, 1976). Consequently, signs of hearing loss include a lack of response to loud noises which are outside of the child's field of vision, lack of response when called, inattention, and delayed speech and language (Cardwell, 1956). Children with cerebral palsy, however, may not be able to manipulate their own bodies to indicate a response nor be able to turn their heads in the direction of the sound source. Besides, a delay in spoken language and defects in sound production may be a result of oral-motor dysfunction or other physical disability, characteristic of the general cerebral palsy population.

So, although signs exist which alert a parent to a possible hearing loss, these same signs in a child with cerebral palsy may not necessarily be indicative of hearing loss. Therefore, it is imperative that all children with cerebral palsy be routinely tested for hearing impairment. The earlier a loss is detected, the earlier appropriate measures can be taken to aid speech and language functioning.

How to help with hearing testing

An *audiologist*, skilled in the testing of children with some training in the management of cerebral palsy, should test your child's hearing. Hospital personnel or your pediatrician can recommend an audiologist. An audiologist may be located in a hospital, a university, or a private speech and hearing clinic. The purpose of the hearing test is to determine if a child hears, how much a child hears, and the type and location within the ear of any hearing impairment (Nober, 1966). Modifications must be made from the usual testing procedures, due to the cerebral palsied child's physical disability. In addition, your child is probably easily distracted, tires easily, and cannot try hard on one task for too long (Fisch & Back, 1961). For these reasons, testing is difficult and time consuming. Repeated visits to the audiologist are often necessary. On test days you may want to bring along your child's favorite toy in order to maintain interest (Craft, 1969). The type of test administered will depend on your child's age. The greatest difficulties in testing often occur with very young children, but this is the time when it is most important to find out about your child's hearing ability. The audiologist will measure your child's gross response to sound using voice and noisemakers such as bells, car noises, running water, and animal noises. Your observations of your child at home, such as reporting how you know when your child responds to sound, will be helpful to the audiologist. Does your child turn in the direction of a sound with his or her head, eyes only, or whole body? Can you feel a muscle movement in reaction to sound when your child is sitting on your lap? In a younger child, tests which rely on a reflexive response, such as change in skin sweat glands in response to sound, can be used. Tests also exist to measure exactly what is occurring with the mechanics of the ear. These reflex tests and tests on ear mechanics are not always reliable and they can be difficult to administer (Cox & Lloyd, 1976). A cerebral palsied child, for example, may not tolerate the ear probe that is required for one such test. These difficulties highlight the need for careful observation of your child's response to sound at

home and your need for patience in these repeated efforts at hearing testing. Older children can be taught to perform a motor act when they hear either a pure tone, which sounds like a beep, or a speech sound. You can help the audiologist by suggesting a motor act you know your child can perform. Following is a list (Fisch & Back, 1961) of some signals which have been used successfully by cerebral palsied children:

1. Using hands

- Placing a brick in a box

- Pushing a brick off the table by a sweeping movement when the child is unable to hold the brick

- Touching an object placed in a suitable position

- Releasing an object such as a small ball placed in the hand, into a conveniently placed box

- Pushing a toy around

- Raising the arm

- Banging a drum

2. Using feet (when the child has no voluntary control of the hands or arms)

- Kicking a small ball off a suitably placed low table

- Pushing a brick or a ball off the table by a sweeping movement

- Picking up small beakers by the toes

- Raising the leg

- Stamping the floor

3. Using head or body

- Nodding

- Opening and closing the mouth

- Pushing the head or body against the back of a chair (a squeaker toy can be placed between the head and the back of a chair and the child can be trained to squeeze it when the test sound is produced)

4. Using speech sounds (owing to the frequent involvement of the speech mechanism, this is not always possible)

- Saying "Yes" or a similar word or sound

- Producing any type of babbling or grunting sound

Using any of these signals or any others you can think of, like having your child press your hand, you can train your child for a hearing test by teaching her or him to associate the chosen signal with hearing a sound. Collect some noisemakers like a drum, bell, whistle, spoon and pot, or squeaky toy and, if the audiologist recommends, have earphones or something similar like stereo headsets or earmuffs. Then practice these steps with your child. Children's Hearing and Speech Center. (For this example, the signal is touching a block.)

1. Sit facing your child.

2. Have the block on a table between you and have the noisemakers available.

3. Sound a noisemaker (alternate noisemakers), and immediately touch the block. Indicate with vivid facial expressions that you heard a sound.

4. Repeat this sequence about three times.

5. Sound a noisemaker and move your child's hand to touch the block.

6. Repeat this sequence about three times.

7. Indicate by gesturing and by saying "you do it" that your child is now to move her or his hand alone.

8. Sound the noisemaker and wait for your child to touch the block. Remember that because of your child's physical disability, she or he may be slower to react.

9. Reward your child for touching the block after hearing the sound by clapping your hands, kissing your child, or giving your child a favorite, small piece of food.

10. After about three successful sequences, place the earphones on your child's head. Do not insist if your child refuses them or cannot keep them on.

11. Continue to practice sounding the noisemaker and requiring the selected response from your child with or without the earphones. Do this for a few minutes at different times during the day, and over a number of days.

12. After about three successful sessions, remove the noisemakers from your child's field of vision, so she or he responds to the sound only.

This procedure may be time consuming and it may be hard to keep your child interested, but once your child has learned to perform a movement in response to a sound, the audiologist can do a more complete test of hearing ability. The audiologist will vary the loudness and pitch of sound to determine exactly what type of sounds your child can hear.

When testing is complete, the audiologist will explain the results. Ask for further explanation for anything that is not clear concerning the type of test, the results, or the implications for your child.

Understanding the results of hearing tests

If your child has a hearing loss, the audiologist will probably indicate to you that the loss is either mild, moderate, or severe. A child with a mild-moderate loss has defective, but functional hearing ability. In a child with a severe hearing loss, the sense of hearing is nonfunctional for the ordinary purposes of life (Cardwell, 1956). This child may be considered *deaf*. Even deaf children, however, have some *residual hearing*, hearing they can be taught to use.

Your child's hearing loss may be present in one ear, termed a *unilateral impairment* or in both ears, termed a *bilateral impairment* (Cox & Lloyd, 1976). A child with a unilateral hearing loss, not affected by cerebral palsy, can usually compensate for the loss by turning the head rapidly or moving to the source of the sound and changing positions quickly when necessary (Fish, 1955). A child with cerebral palsy, however, is not able to physically adjust as rapidly. Therefore, in a cerebral palsied child, a unilateral loss may cause some of the same problems in speech and language acquisition as a bilateral loss.

Your child's hearing loss will also be described as *conductive*, *sensori-neural*, or *mixed*. A brief description of the anatomy and function of the ear will help explain this terminology. The ear is divided into three parts: the outer, middle, and inner ear. The outer ear consists of the earflap, the portion of the ear you can see, the ear canal, and the eardrum. The function of the outer ear is to capture sound and transmit the sound to the middle ear. The middle ear consists of three tiny bones which vibrate when the eardrum vibrates, and thus transmits sound to the inner ear. The fluid-filled inner ear converts the sound vibrations to nerve impulses which are sent to the brain. In a conductive loss, there is damage to the outer or middle ear, and the sound is essentially blocked. Since children with conductive losses hear words and noises faintly, they often speak softly, not realizing they are in a noisy atmosphere and should talk louder. Since sounds are blocked in children with conductive losses, talking louder to such children can help. Your audiologist may refer you to an otologist, or ear, nose, and throat specialist, if your child has a conductive loss. The *otologist* will be able to determine what is causing the blockage of sound, be it excess wax in the ear canal or a buildup of fluid behind the eardrum, and can recommend necessary treatment. A sensori-neural loss, which cannot be corrected, more seriously affects speech and language development. In a sensori-neural loss there is damage to the inner ear or brain. Characteristically, sounds and words are heard but they sound distorted and are not perceived accurately. Children with sensori-neural type hearing losses, unable to hear their own voice, may shout in situations where it is not appropriate to use a loud voice. The majority of athetoids with hearing loss experience this sensori-neural type loss where they hear low frequency sounds, such as vowels like ē, but do not retain high frequency sounds like s, th, f, t, g, sh, and k. High and low frequency refers to the rate at which sound reaches and penetrates the ear (Rutherford, 1948). Therefore, if your child has this high frequency type of hearing loss, words like cat, tap, and pat each sound like "ah" to your child. A mixed hearing loss is a combination of conductive and sensory hearing losses, and thus presents problems of

both types of loss. Again, referral to an otologist is necessary to correct the conductive part of the loss.

Finally, your child may have a fluctuating hearing loss. Children experiencing severe spasms may not hear as well during the spasms (Mysak, 1971). Also, if your child is seated and cannot keep still, the noises created by the body movement may block some sound. Helping your child to remain still and seating him or her in a cushioned or soft chair, for example, may alleviate some of this problem.

A child with a hearing loss of any type requires some special help to develop speech and language abilities.

How to help develop speech and language skills

There are many ways you can help in the speech and language habilitation of your child with cerebral palsy and hearing loss. Your efforts will focus on improving your child's listening ability, on helping your child to use as much residual hearing as possible, and on aiding *receptive* and *expressive* language development.

Begin by helping your child learn to listen and to be aware of sound. One of the most important things you can do is to talk to your child and encourage all those who are present to talk to your child also. Stand no more than three feet from your child when talking and make sure your face is not obscured. Talk directly to your child using facial expressions, gestures, speaking slowly and distinctly without exaggerating sound production, and using full sentences whenever appropriate. Make listening enjoyable for your child by talking about ongoing situations and about objects and actions that the child can see. Following are some suggested situations when you can talk to your child (Alpiner, et al, 1977):

1. Feeding times

- Talk to your child while she or he is eating.

- Tell your child what is hot and cold and what each food is; talk about the bottle, cup, and other utensils.

- Say things like, "Isn't that good," "Look how nicely you're eating," "That food tastes good," "Open your mouth," "I know you're hungry."

2. Bathtime

- Talk to your child while you are bathing her or him.

- Tell your child about the soft, warm water; talk about the soap and shampoo, squeaky bath toys, and towels.

- Say things like, "You're all wet now," "You are so clean," "The rubber duck goes quack," "Let's wash your face," "We'll clean your nose and ears and tummy and legs."

3. Dressing time

- Talk to your child while you dress or change her or him.

- Tell your child about the shoes, socks, pants, and shirt; talk about the dirty diaper and the powder.

- Say things like, "I'm taking off your shoes," "Now I'm tickling your feet," "Oh, is your diaper dirty," "Here goes the powder," "Now you are all dressed."

Use the same words many times and put words to all experiences. It is important to talk even if your child does not respond or seem to hear you. Encourage and reward any attempt your child makes to imitate your mouth movements and vocalize, but do not be concerned with accuracy of articulation.

This listening training is the prelude to the learning of *speech or lip reading* which is the focusing on speaker's lips and facial expressions to determine what is being said. Your child will learn to associate facial expressions and sound patterns for certain words. Many sounds and words, however, look alike on the lips and many sounds are not visible on the lips making speech reading a very difficult task, especially with speakers who talk rapidly or unclearly. Therefore, besides talking to your child to develop an awareness of sound, you should supplement your speech with *sign language*. Sign language is the manual representation of words or whole expressions. A sign, for example, used to mean want is made by holding the arms out at waist level with the palms up, and then drawing the arms toward the waist. A number of different sign systems exist, some having grammars different than spoken English. You can learn a sign language system with help from an audiologist, *speech pathologist*, educator of the deaf, or perhaps at a local college adult education class or through a community class sponsored by a recreation department. Learning sign language and using signs when talking to your child will greatly enhance his or her ability to understand your messages and will help your child to learn the use of sign language.

Also important is teaching your child to use whatever residual hearing she or he has. This is called *auditory training*. Your audiologist may recommend a hearing aid to amplify sound especially if your child has a conductive hearing loss. A severely involved cerebral palsied child, who falls a lot or who has frequent, uncontrollable movement, such as athetoids, may not be able to use a hearing aid since damage may occur to the aid or to the child (Mecham, et al., 1960). Also, a cerebral palsied child may not be able to control hand movements enough to learn to turn on a hearing aid or adjust the volume (Hardy, 1953). Even without a hearing aid, sound can be amplified by talking directly into your child's ear, or using a homemade hearing tube, which closes the distance between the sound source and the child. To make a hearing tube, attach about a 20-inch length of rubber tubing to a small metal funnel and an earpiece like the end of a doctor's stethescope. Use the hearing tube on yourself first to determine the loudness and the sensation created inside the ear (Kastein, 1952). If the hearing tube is being used, place the earpiece into your child's ear and talk into the funnel. Repeat any words or sounds without the tube so your child can see your mouth. With or without amplification, auditory training proceeds by helping your child to associate environmental sounds with their source. Some suggestions for ways you can help include knocking on the door or calling your child's name before

you enter a room; playing the radio or a record with rhythmic drum or piano music; alerting your child to the doorbell or telephone when it rings; and ringing a bell from different parts of a room. Continue talking to your child during daily routines and encourage your child to look at your face, touch your mouth opening and closing, and feel the vibrations in your throat as you talk.

The audiologist or speech and language pathologist will help you decide which mode of expression is most feasible for your child, either speech, sign language, *finger spelling* (which is the use of a manual alphabet to spell words), pointing on a *communication board* (which has pictures or words fixed to a board) or a combination approach. Certainly, there are pros and cons for each communication system. Sign language, for instance, limits the number of people with whom a child can converse. Sign language, however, can be used to facilitate speech rather than serving as a substitute for speech. Indeed, sign language may be useful for a child with cerebral palsy who is more severely involved motorically in the lower extremities. Such a child may have poor articulation skills but good hand movements. Another beneficial aspect of sign language is that a teacher or parent can modify incorrectly produced signs more easily than incorrectly produced speech sounds by physically manipulating the child's hands. These are only a few of the considerations in deciding on the most effective communication system for your child.

Regardless of the means for expression, the sequence and strategies for teaching your child receptive and expressive language are the same. Receptive language involves the comprehension rather than the production of language. Your child has to learn that objects and actions have names. You can teach your child to recognize these names by presenting an object like a block, and saying the word "block" and/or producing the sign for block. Ask your child to "Show me block." Your child can point or use any motoric response which he or she is able to perform. Add additional items until your child, when shown a number of items simultaneously, can recognize the one named.

Next, you can teach your child to imitate single words and/or signs. Always associate the word or sign with the object or action it represents. For example, say the word "ball" and/or produce the sign for ball before throwing a ball in the air or handing one to your child. Once your child can imitate the single word, ask your child a question concerning the object or action. While throwing a ball, for example, ask your child, "What is this?" or "What am I doing?" In selecting words, use those that are meaningful and significant to your child which can help in communicating needs or desires. Once your child has a vocabulary of about 20 object words and 10 action words, begin to make combinations of the words and/or signs. The word combinations used should be about people or objects performing actions like "mommy run," "book fall," "baby eat," about actions performed on objects like "throw ball," "want drink," or "push truck," and about people or objects and their locations like "ball floor," "drum table," or "baby bed." Follow the same strategy used in teaching single words of progressing from imitation to asking questions when teaching word combinations. Continue to teach your child new words and utterances.

Select specific times during the day to do formal teaching for about 15 minutes per session. All during the day require your child to use any words and/or signs you know are within his or her ability. You have been successful in your efforts with teaching listening skills, *speech reading*, auditory training, and

speech and language development if your child learns to communicate more effectively, interacting with peers and adults, expressing needs, answering questions, describing experiences, and thus having some control and influence within the environment.

Other considerations with a cerebral palsied child with hearing impairment

Educational placement will be an issue you will have to consider. Currently, there are schools for the deaf and schools for the physically disabled. The ideal placement would be a school with personnel trained to help children with both disabilities. If you cannot find such a placement, determine which school can best serve your child's needs; does the school provide speech and language training? Auditory training? Physical therapy? Occupational therapy?

Finally, you as a parent of a multiply handicapped child would probably benefit from parent counseling and discussion groups led by someone knowledgeable in the areas of hearing impairment and cerebral palsy. You could share information, feelings, and concerns about your child and receive advice, support, and understanding from others (Zamochnick, 1973).

Indeed, helping your child to make the best use of limited hearing and motor function, thus enabling your child to communicate effectively, is a great task. Providing this help in an atmosphere of love and acceptance requires much patience, effort, and commitment. Your child with cerebral palsy and hearing impairment requires no less.

GLOSSARY

1. *audiologist* - a person trained to do hearing testing and to rehabilitate those with hearing impairment.

2. *auditory training* - a method used to teach a hearing impaired person to make maximum use of remaining hearing.

3. *bilateral impairment* - a hearing loss in both ears.

4. *communication board* - pictures or words fixed on a board which a child points to as a means of expressive language.

5. *conductive hearing loss* - a type of hearing impairment where sound waves are blocked due to damage in the outer or middle ear.

6. *deafness* - the sense of hearing is not functional for the ordinary purposes of life.

7. *expressive language* - the aspect of language related to production such as speech, sign language, finger spelling, and pointing on a communication board.

8. *finger spelling* - the use of a manual alphabet to spell words.

9. *hard of hearing* - the sense of hearing is defective but some functional hearing ability exists.

10. *mixed hearing loss* - a combination of the conductive and sensory type hearing losses.

11. *otologist* - a person trained to study and treat disorders of the ear mechanism.

12. *pure tones*-- sounds presented at various levels of frequency and loudness to test hearing.

13. *receptive language* - the aspect of language related to comprehension rather than production.

14. *residual hearing* - the sense of hearing that remains in a person with a hearing impairment.

15. *sensori-neural hearing loss* - a type of hearing loss where sounds are heard incorrectly due to damage to the inner ear or brain.

16. *sign language* - the manual representation of words or whole expressions.

17. *speech and language pathologist* - a person trained to assess and implement treatment for persons with receptive and/or expressive speech and language disorders.

18. *speech or lip reading* - the focusing on speaker's lips and facial expressions to determine what is being said.

19. *unilateral impairment* - a hearing loss in one ear.

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Chapter 4

BREATHING AND SPEECH

By Arlene Golbin, C.C.C.

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BREATHING AND SPEECH

Arlene Golbin, M.S., C.C.C.

The child with cerebral palsy has difficulty coordinating patterns of muscle movement. Yet such coordination is necessary for normal breathing. Likewise, an efficient and controlled breathing pattern is one of the prerequisites for speech.

The purpose of this chapter is to explain the relationship between breathing and speech so that parents may better understand some of their child's possible difficulties. Specific guidelines are given to assist parents in assessing their child's abilities. In some instances suggestions for corrective steps are given.

Abnormal and immature breathing patterns are not easily or quickly changed. In general, the muscles and organs involved cannot be directly manipulated by the parent. The approach to better breathing is less direct than the approach to some other problem areas such as feeding. An underlying "key" is overall body positioning. Better breathing will be established by positioning which promotes normal muscle tone and normal movement.

For the human organism there is no extended life without breath. Breathing is also the "power-source" for that amazingly complex and exclusively human ability--speech. From a survival point of view, *respiration* serves the purpose of providing for an exchange of gases between organism and environment. This is accomplished through *ventilation*, the passing of air in and out of the lungs. This biological function is normally served even during the competing process of verbal communication. To speak we need to use the same structures that we need for the oxygenation of the body. These two functions do not appear to be compatible and yet a compromise is reached between our metabolic needs and the flow of words. Our nervous systems are able to monitor and coordinate the concurrent processes of taking in oxygen, giving off carbon dioxide, and talking the whole time we are doing so, if we so desire.

This may not be true, however, of the child with cerebral palsy. It is necessary to take a closer look at both the normal respiratory process and at what may happen if its development is limited or abnormal. The quality of a child's voice is inextricably interrelated with his breathing patterns. The more normal the pattern, the greater his vocal potential.

Note to readers: Words which are italicized appear in this chapter's glossary for easy reference.

It cannot be overemphasized that the development of a normal breathing pattern cannot be viewed as an isolated phenomenon. Normal sound production is dependent on, 1) normal body movement or *mobility*, 2) normal physical *stability*, and 3) normal *alignment* of the body, especially the head and torso. The development of mobility, stability, and alignment are all interrelated. As a normal baby develops he battles with gravity and eventually wins. First, he develops head control, learning to lift and turn his head and to align it with his body, despite the tug of gravity pulling against it. Gradually he learns to sit, crawl, stand, and walk. Developing these abilities causes change in his physical structure. Some of these changes are necessary for efficient respiratory function. For example, a newborn's ribs are essentially perpendicular to his spine. However, by about three years of age, the child who has been erect and walking has been acted upon by gravity and his ribs will tilt downward in their mature position. (The significance of the ribs in relation to respiration is discussed in the following section, "The 'Mechanics' of Breathing.") All along, the child's developing gross motor skills contribute to more voluntary breath control. This emerging breath control permits him to experiment with making more and different kinds of sounds.

For the child with cerebral palsy, all exercises and positioning which lead to normalized *muscle tone* and proper head and body alignment will be contributing to the development of more normal, and thus more efficient, respiratory movements.

The "Mechanics" of Breathing

The following is a basic and general explanation of what actually takes place during breathing. It clarifies the structures that are involved and describes the relationship between breathing and producing sound for speech.

The supporting framework for breathing is the skeleton of the torso or trunk of the body. This includes the spinal column, the rib cage, the "collar bones" or clavicles, the "shoulder blades" or scapulas, and the bones of the pelvis. The torso is divided into an upper part, the thorax, and a lower part, the abdomen (See Diagram 20 on next page). The thorax contains the heart, lungs, and *trachea*. The trachea is the tube which connects the lungs to the pharynx through which air passes by way of nose and mouth (See Diagram 21 on page 68). The abdomen holds our digestive tract and other organs. The two cavities are divided by what some have called the second most important muscle after the heart, the *diaphragm*. The diaphragm is the single most important muscle of breathing. An infant depends upon it almost entirely. When it contracts it moves down and forward, increasing the size of the thoracic cavity above it. The increase in volume of this cavity brings about a decrease of pressure in the lungs. Once the pressure in the lungs is *negative pressure*, meaning less than atmospheric pressure, air rushes in through the nose or mouth, past the larynx, down the trachea, and into the lungs until inside and outside pressures are equalized. This phase of breathing is known as *inhalation* or *inspiration*. In addition to the diaphragm there are a number of other accessory muscles of inhalation. Their functioning is quite complex, but it suffices to say that they contribute to expansion of the thorax, by rotating and raising the ribs, and to controlling exhalation, especially during speech.

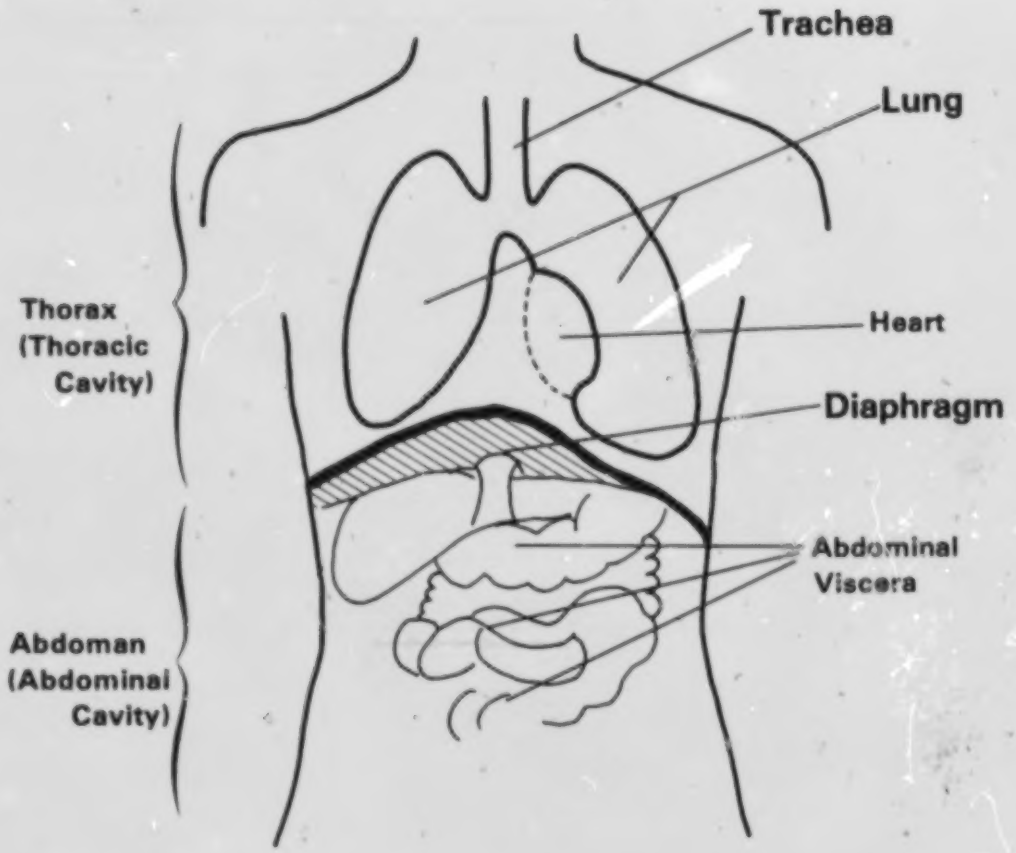

DIAGRAM 20: THE DIAPHRAGM DIVIDES THE THORAX FROM THE ABDOMEN

The process of *exhalation*, breathing out, is a more passive phenomenon. Lung tissue is very elastic and "wants" to return to a collapsed position (think of a filled balloon). The ribs, which have been elevated by muscular action, "want" to return to their normal resting position. When the diaphragm contracts it flattens and lowers, thus compressing the abdominal organs below it. These naturally decompress, shoving it back up. Muscles of exhalation are also actively working to decrease the size of the thoracic cavity. All of these forces bring about an increase of pressure in the lungs. The air flows out, up the trachea, past the larynx, and out through the mouth or nose until the internal pressure is equal to atmospheric pressure.

During both inhalation and exhalation air passes through the *larynx*. This structure, commonly called the "voice box" or "Adam's apple," is located at the uppermost part of the trachea and thus is part of the respiratory passageway. It is a specialized valve that acts to open or close the air passageway. Closure permits activities requiring a build up of abdominal pressure such as bowel and

bladder evacuation, or lifting heavy objects. A cough is a sudden release of compressed air, by this valving mechanism, for the purpose of clearing the passageway of an accumulation of mucus or a foreign body. In addition to serving these biological functions, the larynx is also the structure which generates sound. This sound is subsequently modified by other parts of the vocal tract to produce speech. The sound is made when the two vocal folds (also called "vocal cords"), which are part of the larynx, are brought together by muscular action. The air, rising from the lungs below, blows them apart. With this escape of air the pressure beneath the vocal folds decreases and the elastic nature of the tissue makes them fall back into their closed position, until the pressure builds up once more. This opening and closing represents just one cycle of vocal fold vibration. This vibration occurs over 270 times a second in a child's normal production of a vowel. The air stream from the lungs, on its way out of the body, is the power source for sound production. This sound for speech is called *phonation*. When we breath and no sound is being made it means that the vocal folds are drawn apart giving the escaping air an unblocked pathway out.

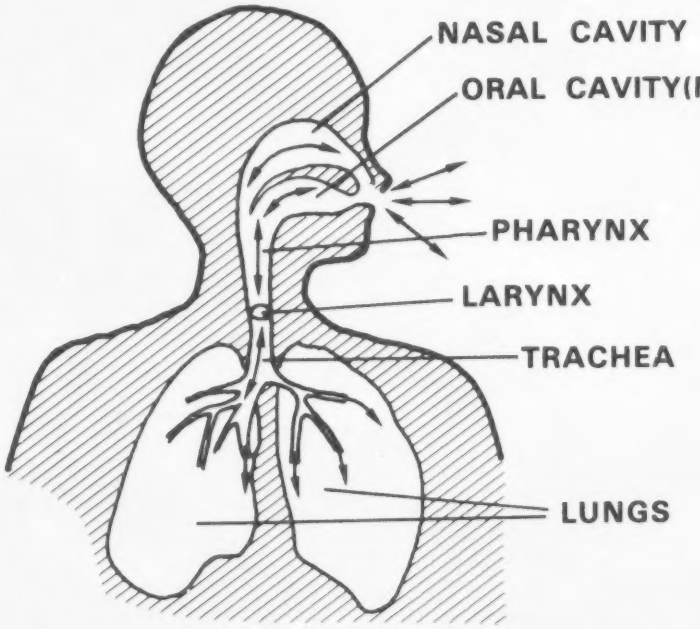

DIAGRAM 21: THE RESPIRATORY PASSAGEWAY

Summary

The above brief descriptions of the normal mechanisms for respiration and speech sound production illustrate the strong interrelationships between these

two functions. Breathing is the "power source" for speech. The same anatomical structures are shared to accomplish both. It is through complex acts of muscle coordination, involving patterns of muscular movement from the abdomen to the larynx, that speech sound, or phonation is produced. This should indicate to the reader why these same processes may constitute serious problems for the child whose neurological disability has resulted in loss of functional muscular control.

Some Common Problems

The following are observations which may help parents gain more accurate and specific insight into their child's particular problems. The types of respiratory and phonatory difficulties that a child with cerebral palsy may have will naturally vary with the nature and severity of his particular condition.

1. Is significant uncontrolled activity present in the child's torso? Are speech attempts accompanied by uncontrolled body movements? This should immediately lead the parent to expect their child to have difficulty with the quick inspiration and the long controlled air release necessary for phonation. Speech may seem "jerky." The child may attempt to speak and not be able to initiate any sound. The volume of his speech may vary in an uncontrolled way. Positioning which maximizes normalized muscle tone and head and body alignment is crucial in such cases. (See Chapter I, "Positioning for Speech.")

2. Is the child's spine rigid and "fixed" in an abnormal position? This may inhibit the free normal movement of the diaphragm and ribs. Shallow and more rapid breaths may be observed. Difficulty sustaining phonation may result.

3. Does taking in a deep breath seem to cause the child's arms and legs to straighten or extend, especially when he is lying on his back? Inhalation is associated with extensor spasticity. *(Think of stretching and tilting your head back when yawning.) If the child is still governed by such extremes of overall muscle tone he will not yet have control over the specific muscle groups which are normally activated in a coordinated way for respiration. He may become "stuck" in such an extensor pattern and thus be unable to breathe out to make any sound. Positioning to inhibit the extension pattern is desired. This means that flexion, especially at the hips and the neck should be provided. Placing the child on his stomach, or bolstering him into a fetal-like position on his side is generally preferable to leaving him on his back. For some, a hammock, built from a sheet or firm netting over a stable frame, and placed above a bed or mat (for safety), is a useful device for assisting in better positioning. Likewise, the child with high* flexor spasticity *may have difficulty breathing if positioned lying on his stomach, as this will increase flexor tone. (Think of how a newborn keeps his limbs bent when sleeping on his stomach.) If such is the case, positioning the child on his back may be helpful. Positioning the child on his back if inhaling is the major problem, and on his stomach if exhaling is the main difficulty, should be tried.*

4. Do the child's ribs look "flared?" When he breathes does all movement seem to be in the stomach area? As explained previously, abnormal muscle tone and immature postures will delay normal structural changes. Lack of anti-gravity control, preventing upright positions, prolongs the kinds of breathing structure and patterns which are seen in infancy. Once again, the approach to the problem lies in eliciting the movement and the stability necessary for upright positions.

Exercises which promote proper rolling over and sitting can be suggested by a physical therapist. In addition, there are some exercises which may help to stimulate expansion of the thoracic cavity. These primarily involve manually forcing a deeper exhalation which may then cause a deeper inhalation. There are several different techniques for accomplishing this, however, appropriateness varies quite significantly from child to child. While a parent may ultimately carry out such procedures, they should do so only after specific demonstration and training from an appropriate professional. Thus, rather than describe techniques, we urge that a speech pathologist or physical or occupational therapist, with training in neurodevelopmental procedures, be consulted if at all possible.

5. Is he able to control whether he is breathing through his nose or his mouth? Does he continue to breathe through his nose even when attempting to speak? A young infant breathes primarily through his nose. However, as we mature, we develop two different breathing patterns. When we are breathing normally at rest, we do so through the nose. This is called vegetative breathing pattern. For speech purposes, however, we both inhale and exhale through the mouth. The nervous system normally monitors our switching back and forth between vegetative and speech breathing patterns automatically. The techniques referred to in #4 above are primarily to improve vegetative breathing. When spontaneous differentiation between nasal breathing and phonation does not occur, nasal breathing must be established first. The child's jaw, and if necessary, his lips, are held closed with the head slightly flexed (bent) forward. As the child adjusts he will hold this position with less and less help, until he can do so on his own. This will help breathing become deeper and more rhythmic. Once this has been established, speech breathing may be facilitated by:

a) practicing inhaling through the mouth instead of the nose before exhaling to produce sound. A good "beginning" sound to practice with is a vowel such as "a" as in "hat." If necessary, the parent or child can pinch the nostrils closed, for brief periods, to ensure air intake through the mouth.

b) practicing quick inhalations followed by a slower, controlled, extended exhalation which is accompanied by sound production. The best type of sound, or sequence of sounds to be practicing, will vary from child to child. A speech pathologist is the best resource for offering specifics. However, a good starting place is often with the vowel sounds easiest for the child. "A" as in "hat," "o" as in "hot," "u" as in "up" and "e" as in "egg" are often easier than such vowels as "oo" as in "moon," "ee" as in "green," or "ay" as in "hay," which require more tongue and lip movement. Another type of practice activity, also to be done on one extended exhalation, involves producing sound combinations which stop and start the flow of air, as would a real sentence. This would involve combining consonants and vowels such as "o" ("hot") and "b" or "g." On one exhalation the child would repeat "o bo obo...." This type of exercise is very interrelated with articulation therapy which would focus on how the child uses his lips and tongue to shape his voice into clear and meaningful speech sounds.

c) "hands-on" techniques for resisting an inhalation momentarily, or for forcing a deeper exhalation which would stimulate a deeper inhalation and subsequent exhalation. These should be monitored or performed by a clinician. The therapist applies light pressure and vibration to the child's chest or back during exhalation. The palms and fingers of the therapist's hands work down from the child's shoulders. They are not removed from the child's body as replacing them

would provide unwanted stimulation. The pressure is gradually increased and held longer during exhalation, before giving way to the next inhalation. The purpose is to get deeper and more rhythmical breathing. This pressure and vibration may accompany sound practice as in b) earlier. It is important that vibration be started before the child starts to produce sound in order to facilitate soft, relaxed and unforced voicing. Changes in speech intonation, or the frequency and loudness of the voice, can be induced by changing the speed and intensity of the pressure. Once consonant sounds are introduced (after vowel practice) they are always practiced in syllables rather than in isolation.

If the presentation of any of these activities causes undesirable changes in muscle tone they should be discontinued and rethought. Questions such as, "Is a different reflex inhibiting posture needed?" "Is my child ready for this or are there steps which should precede this activity?" should immediately come to mind.

6. Does his breathing seem to be very fast and shallow? The normal number of breaths per minute varies within ranges which decrease as the child matures. Researchers have suggested the following as approximate normal ranges:

a) within the first month of life - 22 to 72 breaths per minute (b.p.m.).

b) first month to sixth month - 21 to 58 b.p.m.

c) sixth month to two years - 25 to 45 b.p.m.

d) two to five years - 21 to 40 b.p.m.

e) five years to ten years - 15 to 31 b.p.m.

Having to breathe very rapidly in order to supply the body with adequate oxygen will obviously interfere with the long, controlled exhalations required to speak a phrase or a sentence. Such rapid breathing is generally an indication that much more gross motor maturation must be accomplished before working specifically on speech is a viable task.

7. Do you observe depression of the upper chest during inhalation? This is symptomatic of what is called reversed breathing. While it is sometimes seen in some infants, it should disappear within a few months. The spastic child may be contracting his thoracic muscles when they should be reflexed. This may be especially evident when the child is trying to inhale before attempting to speak. "Hands-on" professionally directed intervention is recommended.

8. Does the child frequently seem congested? This is a common problem among children with cerebral palsy. Phlegm may block the air passageway at the nose or throat making breathing in general more difficult. As we have all experienced with a bad cold, breathing through the nose may become all but impossible while continued breathing through the mouth seems to contribute to a sore, scratchy, dry feeling in the throat. Common sense must be used to help the child to avoid upper respiratory infections. As his cough and sneeze mechanisms may not be functioning with normal effectiveness, phlegm accumulations may be especially difficult for him to deal with. A physician's advice should be sought for prolonged or very frequent congestion problems. During such problem periods,

"hands-on" activities such as nose-pinching or lip closing to change breathing patterns may not be desirable. Be understanding. Speech attempts at such times may be even more difficult than usual. Attempts to draw in air through stuffed passageways may trigger more undesirable tone changes than usual. If phlegm drainage is a major problem, a physical therapist may be able to suggest specific positions for what is called "postural drainage." Allergy tests may be necessary. Certain foods seem to increase phlegm production. Be alert to such possibilities. Milk is a common "offender."

9. Does meal-time present an increase in breathing difficulty? Some children are not able to coordinate swallowing and breathing activity. Failure to do so may result in food and liquid being taken into the respiratory rather than the digestive tract. This is called "aspiration" and can be quite dangerous to the child's health. Although mealtime should be a pleasant and social experience, it is not a good time for eliciting speech from the child. Attempts to switch from nasal to oral breathing patterns, while trying to coordinate swallowing with this air intake may just be too difficult a task. Refer to the Chapter entitled "Feeding Therapy and Speech" for further information on feeding related problems.

As is the case with all activities performed by those with cerebral palsy, breathing will be best when muscle tone is most normal. Gentle rocking and other slow and rhythmic movement is often a helpful precedent or addition to more static positioning. The goal of such positioning is to prevent undesirable reflexes from determining the position of the child's body and limbs, and to thus allow for the development of normal movement patterns. These lead to the upright positions and subsequent structural changes which foster mature and controlled breathing patterns. Such patterns are prerequisite for good speech.

GLOSSARY

1. *alignment* - the position of different parts of the body relative to one another.

2. *exhalation* - breathing out.

3. *extensor spasticity* - uncontrolled straightening of any part of the body.

4. *diaphragm* - the most important muscle of breathing. It divides the two cavities within the trunk of the body, the thoracic cavity and the abdominal cavity.

5. *flexor spasticity* - uncontrolled bending of any part of the body.

6. *inhalation* - breathing in.

7. *inspiration* - breathing in.

8. *larynx* - the structure which produces sound for speech. It acts as a valve to open and close the air passageway.

9. *mobility* - the ability to change position.

10. *muscle tone* - the state of tension in the muscles at rest and during movement. It is regulated subconsciously.

11. *negative pressure* - air pressure that is less than atmospheric pressure. It is negative pressure in the lungs which causes air to flow in for inhalation.

12. *phonation* - sound for speech. It is produced by the larynx.

13. *respiration* - an exchange of gases between an organism and its environment. It is for this purpose that we breathe and the term is often used interchangeably with "breathing."

14. *reversed breathing* - contraction of muscles of the thorax during inhalation, when they should be relaxed. This can be detected by looking for a depressing of the upper chest during inhalation.

15. *stability* - the ability to hold a position.

16. *trachea* - a tube-like structure through which air passes on its way to and from the lungs.

17. *ventilation* - the passing of air in and out of the lungs.

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Chapter 5

NONVERBAL COMMUNICATION: ALTERNATIVES TO SPEECH

by Michele Susan Reitberger, C.C.C.

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NONVERBAL COMMUNICATION: ALTERNATIVES TO SPEECH

Michele Susan Reitberger, M.S., C.C.C./Sp

PREFACE

The information presented in this chapter stems from two basic sources. One is the author's training and experience in planning and carrying out nonverbal language therapy programs. The other is an extremely valuable text, entitled Non-Vocal Communication Techniques and Aides for the Severely Physically Handicapped, edited by Gregg C. Vanderheiden and Kate Grilley. This text is referred to throughout the chapter and has served as a guideline in the presentation of much of the information concerning nonverbal techniques.

The scope of nonverbal communication techniques is unlimited. This chapter presents an overview of nonverbal communication for persons with limited or no training or exposure in this field. The resource guide within this manual cites numerous references for those who are interested in obtaining more information on the subject of nonverbal communication.

PART I: DEFINING THE PROBLEM

INTRODUCTION

This chapter focuses on communication problems associated with cerebral palsy and techniques by which communication can be achieved through a nonverbal approach. Many forms of "nonverbal communication" have been developed for handicapped persons who are unable to speak clearly or even to speak at all. We will discuss some of the more conventional techniques of nonverbal communication, as well as methods for modifying these techniques to meet certain individual needs. Evaluation procedures and guidelines will also be presented to aid parents and teachers in identifying skills that will promote a good prognosis for success in the use of nonverbal systems.

In approaching the topic of nonverbal communication, there are a host of preliminary questions that parents and teachers may ask of themselves and other professionals. Questions arise such as:

- "Why is speech so difficult for the cerebral palsied individual?"
- "How does a communication handicap affect the total development of an individual?"
- "How can we recognize speech impaired youngsters at an early age?"
- "What is meant by 'nonverbal communication'?"

THE SPEAKING PROCESS

Among the many structures in the body that participate in the speaking process are the lungs, the larynx and the oral cavity. These structures link together and act in a series of specialized and synchronized movements for the production of speech.

It is important to note that the primary biological function of the vocal organs is not for speech production; these organs developed initially to perform life sustaining functions. The lungs, located within the thoracic cavity, are the primary organs of respiration. The larynx, sometimes referred to as the voice box or Adam's apple, is located at the upper end of the trachea (the windpipe or passageway to the lungs). The larynx acts as a valve during swallowing, preventing food from "going down the wrong pipe" by closing off the passage to the trachea. The oral cavity--the mouth--is an area where air enters and leaves the body and where the structures involved in food consumption are located. In order to produce speech, these life sustaining activities must be modified. Therefore, speech is considered to be an "overlaid" function, utilizing life sustaining organs of the body for secondary purposes. In addition to actual movement speech involves cognitive processes--it is a reflection of our thoughts and language. Now, let us examine the manner in which the specialized movements for speech are accomplished.

Speech begins with respiration. As you are reading these words your breathing rate is steady, with an easy inhalation followed by an easy exhalation. Once the speech process begins, this steady respiratory cycle is interrupted. Your easy exhalation becomes controlled and prolonged so that you can say five, ten or fifteen words at a time before needing to inhale more air. As you exhale, your larynx comes into play. The air passing through the larynx causes vibration and sound, just as the reeds of a saxaphone vibrate with the passing of air to produce sound. With split second timing the articulators in the mouth (the lips, tongue, teeth, etc.) begin to form sounds and words you wish to say; the specific sounds produced will depend upon the movements of these articulators. With the completion of this series of events speech is produced, to be interpreted as the words your thoughts have intended. The diagram on the following page illustrates the steps in the speaking process.

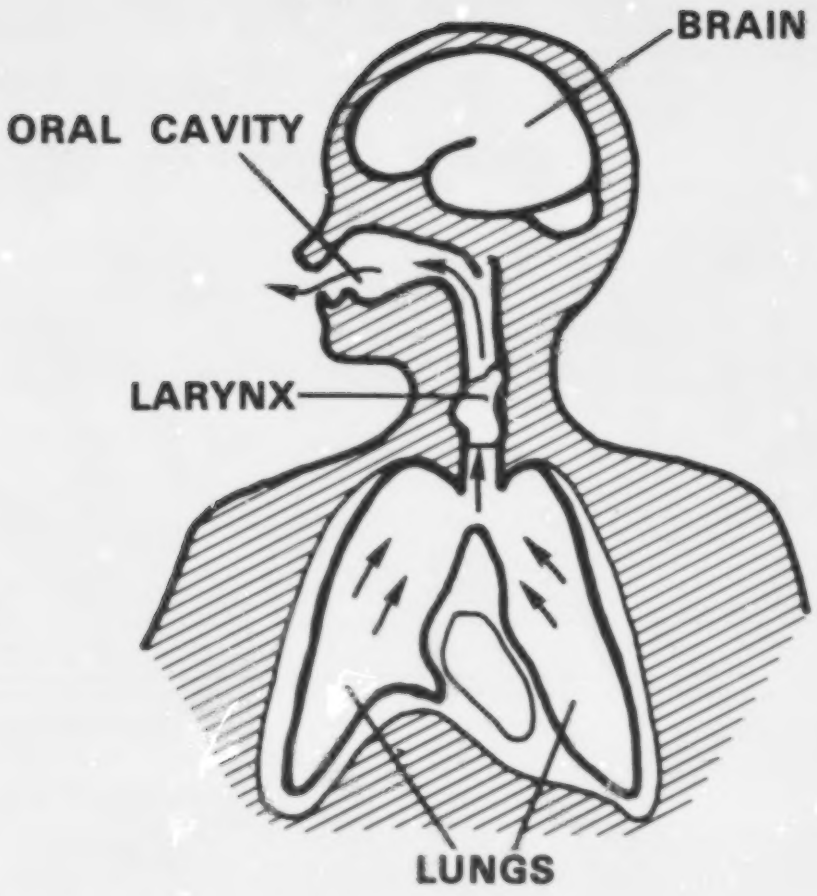

DIAGRAM 22: THE SPEECH PROCESS

NOTE: The above illustration depicts the fundamental activities involved in the speech process. The lungs compress to push air up and through the trachea. The passage of air through the vibrating larynx causes sound to be produced. This air sounding stream continues upward to the oral cavity, where articulatory movements modify it to produce speech sounds. Motor areas of the brain control movements of these structures, while cognitive processes formulate the thoughts that are to be expressed. The final speech product is thus the result of an interplay between motor speech acts and cognitive processes.

In most cases of cerebral palsy the vocal organs are structurally intact. However, due to the nature of the neurological damage associated with cerebral palsy, these structures often cannot accomplish the specialized movements required for speech production. Cerebral palsied individuals may be unable to prolong exhalation for speech or to create a smooth vibratory sound with the larynx. They may be unable to move the muscles of the oral cavity in order to clearly articulate the words they wish to express. Difficulties are often encountered in coordinating and synchronizing movements of the vocal organs so that they occur in the proper sequence and time. Unfortunately, in the case of cerebral palsy, as the effort to gain voluntary control of the vocal organs increases the task becomes more unmanageable. The inability to voluntarily move parts of the body, including the vocal organs, is a characteristic handicap of cerebral palsy.

THE SIGNIFICANCE OF COMMUNICATION

In order to realize the impact of a communication handicap, the importance of communication must be emphasized. The role of communication in our society may be viewed from many aspects; however, this discussion will focus on those aspects which relate most significantly to the cerebral palsied individual. Communication will be viewed in its relationship and contribution to 1) emotional well-being, 2) social interaction, 3) intellectual growth and 4) language development. A disturbance in the development of any of these four elements could result in a communication handicap.

For the cerebral palsied individual, as for many other disabled persons, a communication handicap stems from an inability to speak intelligibly. Since communication involves the expression of ideas through speech, the cerebral palsied individual with inadequate voluntary control of speech will be unable to express himself so that others can understand him. Imagine the frustration of trying to express your thoughts, your feelings, your opinions, even your vital needs and being unable to do so. Imagine the tension, anxiety and depression that builds up from this frustration, sometimes to the point where the only means of coping is to just stop trying--to remain silent. In view of these difficulties, it should not surprise us that cerebral palsied individuals who are communicatively handicapped may develop emotional problems.

In addition to emotional problems, many cerebral palsied individuals with speech handicaps face difficulties in developing social relationships. Phrases like, "We like each other because we can communicate", or "We enjoy each other's company because we can sit and talk for hours", indicate that one of the bases for developing relationships is the give and take of information. This give and take occurs between persons who see each other as equals in exchanging ideas and benefiting from this exchange through a growing relationship. Speech handicapped cerebral palsied individuals may not be seen as likely social partners because of an inability to express information and the resultant incompatability forseen in the communicative relationship. Breakdowns may exist in reaching out to others, as well as in being reached out to by others. As a result of these dreakdowns in communication the cerebral palsied population often becomes socially isolated.

The concept of reaching out is important for social as well as intellectual development. We reach out not only to people but to our environment as a whole and, especially as young children, we learn from the experiences gained

through interactions with our environment. However, if we are unable to participate in the activities around us due to speech and other physical handicaps, we do not gain experiences from which to learn. Learning and intellectual development can be impaired due to a lack of environmental exposure and, in the case of cerebral palsied children, delays in learning can begin in the first and most important year of life.

The first year of life is the first stage in the development of language. From the minute a child is born he begins to develop language. Initially, he experiences the sensations of seeing, hearing and feeling people and objects in his environment. These sensations are stored in memory and are the building blocks for language development. As weeks and months pass, the original sensations a child has experienced become easily recognized and differentiated from each other. It is then that these sensations take on a representational dimension--that of words. The face, voice and touch of a caretaker becomes represented by the words "mommy" or "daddy". The sight of four legged animals, the sound of barking and the feel of fur becomes "doggy", and so on. These are the words of the language used by others in the child's environment which have come to represent his original thoughts and sensations. The learning of these words in association with people, objects and events in the environment is the result of daily language stimulation, given most commonly and often on a subconscious level by parents and siblings.

Possibly most significant of the communication handicaps among the cerebral palsied population is a delay in language development. Many cerebral palsied babies lack ample language stimulation for the same reasons that they lack social interaction and exposure to their environment. According to Bloom (1970), "A young child's success in learning to talk depends on his ability to perceive... (and experience) his environment, the language that is a part of that environment, and the relation between the two". Thus the acquisition of language is crucially related to the child's interactions in his environment. For a child with a physical disability such as cerebral palsy, interaction in the environment will, in some way, be limited. The disabled child may not be able to play with toys appropriately, to go out frequently or to take part in games with other children. Experiences such as these may not appear to be related to language, but they are, in fact, a vital part of communicative development.

Language delays may also develop if speech is discouraged in a young child and this is often the case in cerebral palsy. The cerebral palsied child does not usually respond to his parents in the "normal" or typically expected manner. His early vocal patterns are often "abnormal", without the expected cooing and gurgling signs that most children display. As he grows older, these abnormalities or differences in vocal/verbal behavior become even more apparent and more uncomfortable for others to observe. It is sometimes a natural reaction for parents, siblings and others to encourage speech less frequently because of these behaviors.

EARLY IDENTIFICATION

The earlier we identify children with a risk for developing communication handicaps, the better is our chance for preventing social isolation, learning problems and language delay. There are certain developmental milestones which all

DIAGRAM 23:

Language: Receptive/Expressive

BIRTH TO 1 MONTH	Cries deliberately for assistance. Will quiet when held or when faces come into view. Begins to produce small, throaty sounds. May recognize a parent's voice.
1 MONTH TO 3 MONTHS	Cries less frequently and cries are differentiated due to cause. Laughs and makes happy gurgling sounds. Coos one syllable vowel sounds (ooh, ah, eh...). Vocalizes in response to parent's smile and speech. Turns head to voices, listens to voices and distinguishes sounds.
3 MONTHS TO 6 MONTHS	Vocalizations can be differentiated as happy sounds vs. unhappy sounds. Turns head when name is called. Reacts to differences in intonation: happy vs. angry voice.
6 MONTHS TO 9 MONTHS	Initiates non-speech sounds (such as tongue clicking and lip smacking) and may imitate a few speech sounds. Most vocalizations are "calling" in fashion - non-meaningful play with sounds. Attends to conversational speech - singing - recognizes a few words other than "Mama" (i.e., "nono" and "byebye"). May follow simple directions (i.e. "Give me that.")
9 MONTHS TO 12 MONTHS	May say 5 or 6 words ("no," "bye," "up," "hi," etc.). Babbles short "sentences." Sound play is jargon nonsense. Produces many sounds that are recognized as components of his native language. Recognizes the names for many common objects that he does not yet name by himself.

DEVELOPMENTAL MILESTONES

Cognitive/Manipulative	Social/Emotional
Stares at objects but does not reach for them. Becomes excited when seeing a person or toy but regards them only if they are within his limited field of vision.	Makes eye to eye contact and will attend to a smiling face. May smile back at a face or voice.
Reaches for objects but may be unable to grasp them. May retain an object that has been placed in his hand. Manipulates simple toys. (rattle). Follows moving objects (with eyes and head) from side to side of body. Begins to recognize and differentiate family members by sight. Explores body parts--begins to become aware of dropped objects.	Smiles spontaneously. Reaches for familiar people and cries when they leave. Reaches toward parents selectively. May try to attract their attention.
Reaches to obtain a dropped object. Transfers objects from hand to hand. Constantly places objects in mouth to explore them.	Imitates facial expression. Prefers to play with people rather than objects.
Develops a pincer grasp using thumb and forefinger. Manipulates 2 objects at a time--1 in each hand. May bang objects together and often throws objects together and throws objects and awaits their return by an adult. May build a tower of 2 blocks. Searches for objects that he has seen hidden. Finger feeds a few small edibles.	Repeats an act if it is reinforced (applause, smirk, etc.). Can detect various moods in other people. Begins to play cooperative (or uncooperatively) with other children. Plays pat-a-cake and peek-a-boo games. Often initiates play with others.
Uses a preferred or dominant hand. Throws objects with aim and may release an object on command. Builds a tower of 2 - 3 blocks. Searches for and finds toys by remembering where they were last seen -- without seeing them hidden. Seems to think things out before he does them. Imitates a model even when the model is absent.	Expresses many emotions and recognizes them in others. Fears separation from mother. Becomes bolder in asserting likes and dislikes.

children should achieve at the proper time for developing speech and language. On the previous pages is a chart outlining these developmental milestones from birth to 12 months, in terms of socialization, cognition and language (See Diagram 23). Further details are also included in the Appendix.

"NONVERBAL" COMMUNICATION

Thus far, this discussion has focused on the communication problems associated with cerebral palsy. This has been emphasized in order to convey the need for providing the cerebral palsied individual with some means of communicating. The term "nonverbal" is used to describe alternate communication techniques as well as to describe the condition of some cerebral palsied individuals. However, nonverbal communication systems are not necessarily based solely on the absence of speech. Similarly, the term "nonverbal" does not apply to all cases of cerebral palsy because many of these individuals have developed speech to some extent. An individual using a nonverbal communication device should be encouraged to use whatever verbal skills he has developed in conjunction with his communication aid. A combination of verbal and nonverbal communication techniques is often the most effective approach.

Studies in the use of nonverbal systems have proven that verbalization actually increases rather than decreases, as a result of using the nonverbal technique. This is because the focus is on communicating and away from the act of speaking. The frustration in voluntarily trying to control speech musculature was discussed previously as it related to cerebral palsy. It is for this reason that we cannot always teach speech to a cerebral palsied individual by teaching movements for producing speech sounds; the greater the effort placed in producing the speech movement, the more difficult it often becomes. When not consciously focusing on speech movements, the cerebral palsied individual is in a more relaxed state and apt to be more successful at speaking in the long run. Nonverbal techniques remove the speech act from the focus of attention and may bring about speech in an indirect way. In addition, nonverbal systems are often an individual's first and only experience in effective communication. The feeling of success in being able to communicate may provide a positive outlook on interaction as well as an incentive for communication through speech and/or non-speech methods.

PART II: NONVERBAL COMMUNICATION TECHNIQUES

INTRODUCTORY REMARKS

Communication is a process by which ideas are exchanged between individuals through a system of language symbols. This definition of communication implies two important elements; they are 1) the exchange or transmission of information and 2) the use of language symbols to represent that information. In terms of verbal communication, the speech mechanism acts as the instrument for transmitting information, with spoken words being the symbols which represent this information. In order for nonverbal communication to be effective, these two elements must exist in a manner such that 1) an alternative to the speech mechanism is provided as the instrument for transmitting language symbols and 2) an alternate set of symbols for expressing information is substituted for spoken words. In theory, nonverbal communication

may sound quite complex. However, it is in fact a very logical method of communication that is often easy to teach and easy to learn.

Part II of this chapter will describe various techniques by which nonverbal symbols of language can be expressed, or transmitted. Factors for consideration in preparing, modifying and teaching nonverbal techniques will also be discussed in this section. The reader should bear in mind that each technique described may need to be modified to meet a certain individual's needs. The actual symbols used for nonverbal communication will be described in Part III.

COMMUNICATION BOARDS

A communication board is a display of vocabulary items representing thoughts which the user is unable to express verbally. Most communication boards are fitted onto the arms of wheelchairs, as depicted below, and are used by nonambulatory individuals. The board itself is simply a lap tray and is not difficult to construct. It should be made of a sturdy material, such as plywood. The items on the board should be covered by a clear, protective plexiglass sheet whenever possible. See Diagram 24, below, as an example of a simple communication board that may be fitted on a wheelchair (Diagram 25) or at a standing box (Diagram 26).

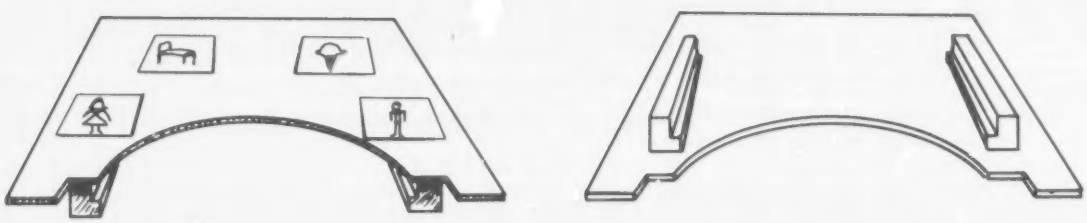

DIAGRAM 24: PICTURE COMMUNICATION BOARD, TOP AND UNDERSIDE

Note the fittings underneath for the arms of a wheelchair. The board simply slides onto the arms of the chair and is held in place by grooves in the fittings.

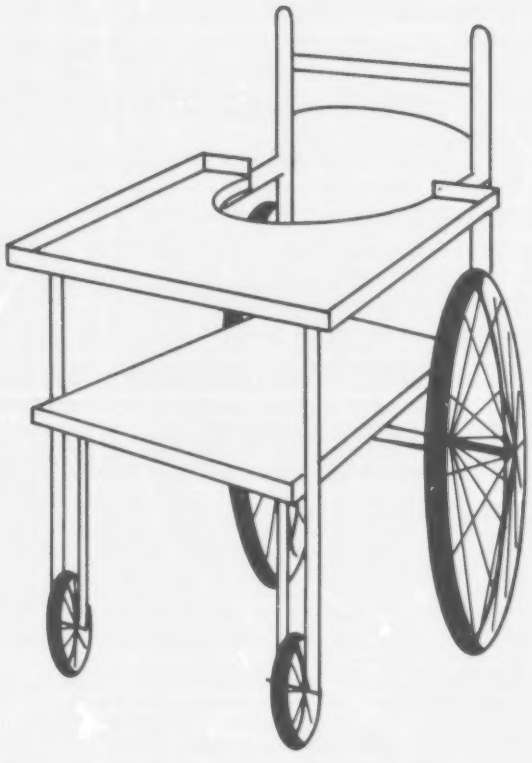

DIAGRAM 25: BLANK COMMUNICATION BOARD FITTED ONTO A WHEELCHAIR

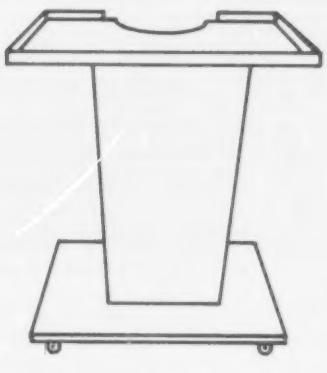

DIAGRAM 26: A COMMUNICATION BOARD FITTED ONTO A STANDING BOX

Note: The board can be fitted with arm rests so that it can be used interchangeably for a wheelchair and a standing box.

The symbols of language displayed on the board may take many forms, such as pictures, written words, letters or other graphic symbols. The items chosen for display will depend upon what has been determined necessary and appropriate for the user of the board to communicate. Symbols for communication will be discussed in Part III of this chapter. Part II focuses on ways in which an individual can transmit or express his language symbols to others.

Eye Localization. This is probably one of the simplest means of selecting an item on a communication board. The user needs only to focus his eyes on a particular item on the board and be sure the listener is aware of the item being expressed.

Eye localization is obviously a highly restricting method for communication. The communication board, being of a reasonable dimension, can accommodate a limited number of items as it is. For communication to be effective through eye localization, the items must be placed far enough apart to prevent confusion on the part of the receiver of the message. The items must also be placed within a comfortable field of vision for the user, accommodating a simple turn of the head.

Eye localization may be an appropriate starting point for those just beginning to use nonverbal communication. This technique requires such minimal voluntary movement that success is usually accomplished quickly and easily, providing encouragement for continuation of the nonverbal program. Eye localization may also be a good preparatory method for simply teaching the user to recognize and discriminate items on the board before more complex forms of selection are introduced.

Pointing. Cerebral palsied individuals who have developed ample control of one or both of their upper extremities should be encouraged to take advantage of this skill by using their hands and arms to point to items on the communication board. A finger, fist or entire hand may be used for pointing, depending upon the abilities of the individual. If finger pointing is difficult, a hand held pointer can be used. Or, a device may be positioned around the wrist with a small, sturdy attachment lying under the palm and forefinger to act as a pointer. A similar device may be fitted to the elbow, aiding in extension of the arm to increase range of motion across the board. A physical therapist must be consulted before attempting to make such a device. The diagram on the next page illustrates a pointing method of communication (See Diagram 27).

Spacing of items on the board is important. The user should be able to point to each item individually so that the receiver of the message does not become confused as to which item is being expressed. Items should be placed within reaching distance; however, placement of items at a slightly challenging distance on the board may encourage the user to reach farther with his arms. Regular monitoring is suggested to assure that this type of item placement is effective and not frustrating. In some cases, communication boards can be built with more area toward the left or right side to allow for placement of more items on a side that can be reached with minimal effort, as depicted by Diagram 28 on the next page.

DIAGRAM 27: A POINTING METHOD OF COMMUNICATION USING A PICTURE COMMUNICATION BOARD

DIAGRAM 28: AN ENLARGED COMMUNICATION BOARD WITH AN EXTENSION TO THE RIGHT

Pointing is probably the most common form of indicating items on a communication board. As will be discussed later, pointing can be used with a variety of devices other than communication boards. It allows for a greater number of items to be expressed than does eye localization and, for those with highly developed arm, hand, and finger control, may permit ease in expressing all of the vocabulary items necessary for them to communicate.

The Head Stick. A head stick is a pointing device with a fitted band around the head and a pointer--a stick or piece of tubing--extending toward the board. The stick may be angled one-half to one-quarter of the way down to facilitate easier reach to the items on the board. Be sure that the pointer is firmly secured to the head band so that it cannot slip out! It is recommended that a physical therapist or an occupational therapist be consulted in fitting this type of apparatus to an individual. Below is an illustration of a head stick (See Diagram 29).

The head stick is an alternative to hand pointing for those who have poor upper extremity control. It does require precise head and eye control for selection of items on the board, as well as tolerance and comfort on the part of the user. It can be used simultaneously or interchangeably with finger or hand pointing, for those who demonstrate a need for several different means of item selection.

DIAGRAM 29: A HEAD STICK POINTING DEVICE FOR ITEM SELECTION

The Light Selector. With this means of item selection, a light source is attached to a head band so that the light aims toward the area of the communication board. In order to express items, the individual focuses the beam of light on the item he wishes to express.

The light selector is simply a variation of the head stick device, requiring precise head control and eye localization abilities. The light selector may accommodate specific individual needs or preferences which the head stick does not.

The Mouth Stick. A mouth stick serves the same purpose as a head stick with the only difference being that its pointer extends from a mouthpiece rather than a head band (See Diagram 30). This device is usually made with a plastic mouthpiece attachment which is fitted behind the upper and lower front teeth. The pointer extending from the mouthpiece may be angled or may extend straight out toward the board, as in the case of the head stick. It has similar physical requirements as the head stick, in addition to the need for oral muscular control to keep the stick very tightly positioned in the mouth.

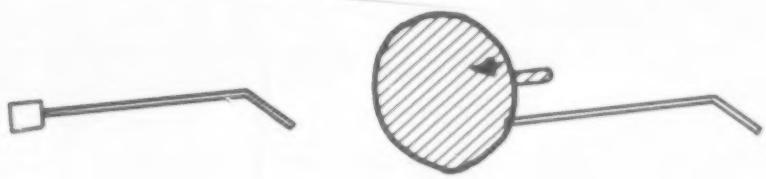

DIAGRAM 30: A MOUTH STICK POINTING DEVICE FOR ITEM SELECTION

Tactile Devices. Tactile devices are made for those whose vision is impaired and therefore cannot use devices that rely on sight, as those mentioned above do. The vocabulary items on this type of board must be raised so that identification and expression of them is based solely on the sensation of touch. Fine motor coordination is required in the use of this type of expressive technique and thus suitability for a population with both sensory and fine motor deficits may be limited.

Sliding Devices. Some individuals are able to use their hands but have difficulty in guiding their arms to locate items on the communication board. Wooden or plastic tracks can be placed under each row of items on the board, with sliding tabs fitted into these tracks. To operate this type of devi , the user must grasp the tab and slide it along its track, stopping when the t. has reached the desired item. This type of device is illustrated below in Diagram 31.

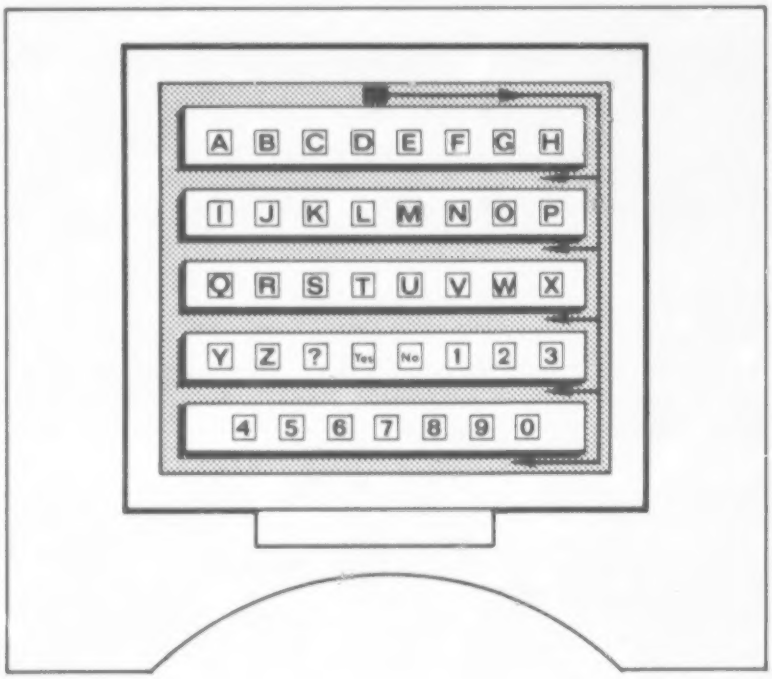

DIAGRAM 31: A SLIDING DEVICE WITH TAB AND TRACK FOR A COMMUNICATION BOARD

Note: A variety of responses other than spelling can be incorporated.

Scanning Devices. Scanning devices are described by Vanderheiden and Grilley (1976) as employing a technique of communication in which "selections or items are offered to the user by a person or display." Here, *the user relies on the presentation of items to him* in order to express his specific choice of items on the board. As opposed to the methods previously described, in which the user must present his choice of items to the listener, a scanning device (in the form of a person or display) presents choices to its user.

The "Yes/No" Response: The simplest form of scanning exists in a situation in which an individual is asked questions and responds either negatively or affirmatively. "Yes" and "no" responses can be in the form of a head shake or nod, a distinguishable verbalization or some sort of prescribed code signaling "yes" or "no."

Our first thoughts about this method of communication are that it involves a drawn out process of guessing, relying on the listerner's luck and intuition in asking the right questions. This may indeed be the case if the listener is not guided by some means of narrowing down his choice of questions. By placing a list of short phrases on the communication board which identify some of the more predictable needs of the individual, such as "I want my book" or "I have to go to the bathroom," elements of luck and intuition are less heavily relied upon. The listener needs only to ask questions relative to the statements on the board and the user either affirms or negates each question appropriately. The number of statements placed on the board may range from two to one hundred, depending upon the user's needs. In the case of an extensive list, statements can be grouped into categories according to similarity so that when the category has been determined, the choice of statements is limited to that category. Statements placed on the board must be carefully chosen according to the anticipated needs of the user. In addition, if the user is unable to read, or has limited reading skills, pictures or single words should be used instead of written statements so that he is aware of exactly what has been placed on his board.

Mechanical Scanning Devices: A mechanical scanning technique of communication employs a mechanism rather than a listener in the presentation of items to its user. It is controlled by an electronic or battery operated mechanical device which presents items on the board, one at a time. When the desired item is reached, the user causes the device to cease further presentations and the correct choice is thus displayed. Unlike the scanning technique previously discussed, mechanical devices are *controlled and operated by the user* rather than by the listener. A variety of mechanisms can be employed as scanners--several of these will be discussed and illustrated below.

--circular scanning: Using this technique a spinning pointer is placed in the center of a communication board, with the items to be expressed surrounding it in a circular fashion. Connected to the spinning pointer is a battery operated switch. When turned on, the switch triggers the spinner to begin rotating, pointing to the items on the board one after another like a clock. The user stops movement of the spinner when it reaches the item conveying the appropriate message. A pointer can be controlled to start or to stop at each item, or to move continuously. The speed at which the pointer moves can also be regulated and should be adjusted to meet the needs of the individual. Controlling devices can take many forms, such as: 1) one lever which, when pulled, starts continuous movement of the spinner and, when released, stops the spinner; 2) two levers, one controlling the "start" and the other controlling the "stop" or; 3) buttons, buzzers, switches or any other simple device which can be easily assembled and run on batteries. On the next page is a diagram of a circular scanning device (See Diagram 32).

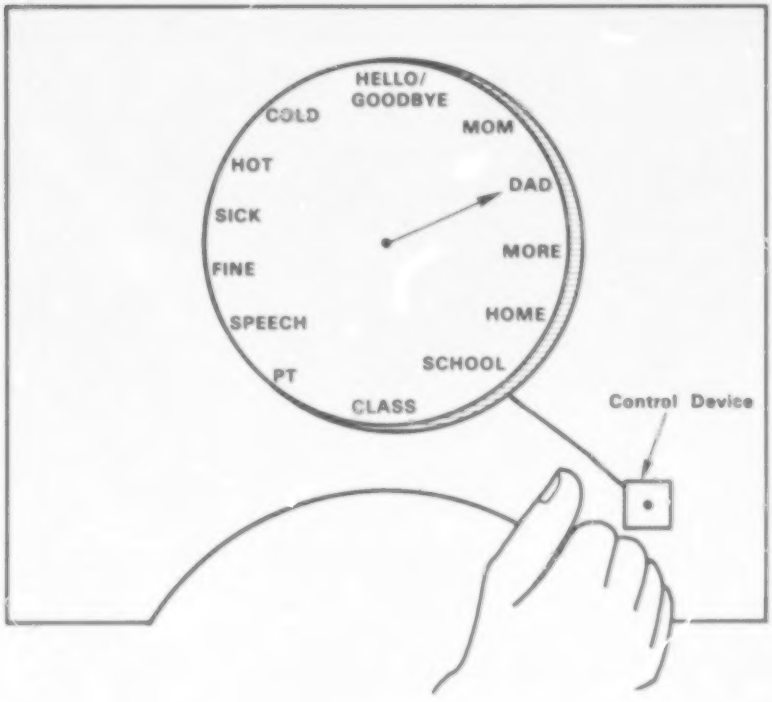

DIAGRAM 32: A MECHANICAL CIRCULAR SCANNING DEVICE

The basic idea of circular scanning can be utilized to develop a variety of devices. For example, items may be placed on a turntable which is attached to a communication board and run by batteries. The turntable can be controlled to stop at a prescribed point, thus indicating the item wished to be expressed. Or, a circular scanner can be mounted on a wall with multiple control outlets so that an entire class can participate.

--*lighted scanning:* This apparatus utilizes a battery operated light as a scanner and functions similarly to a neon sign. On the next page is an illustration of a lighted scanning device (See Diagram 33). As depicted, items are placed in a linear fashion on the communication board and a small bulb is attached below each item. The bulbs may be connected to each other vertically or horizontally by wire. When the mechanism is triggered, each light flashes on and off successively. The mechanism is stopped when the desired item is lighted up, indicating that this is the particular item conveying the desired message. Controls for starting and stopping the circular scanning device can be applied to lighted scanning. As mentioned previously, speed of presentation of the items must be controlled to suit the capabilities of the user. Diagram 34 and 35 show other types of lighted scanning devices.

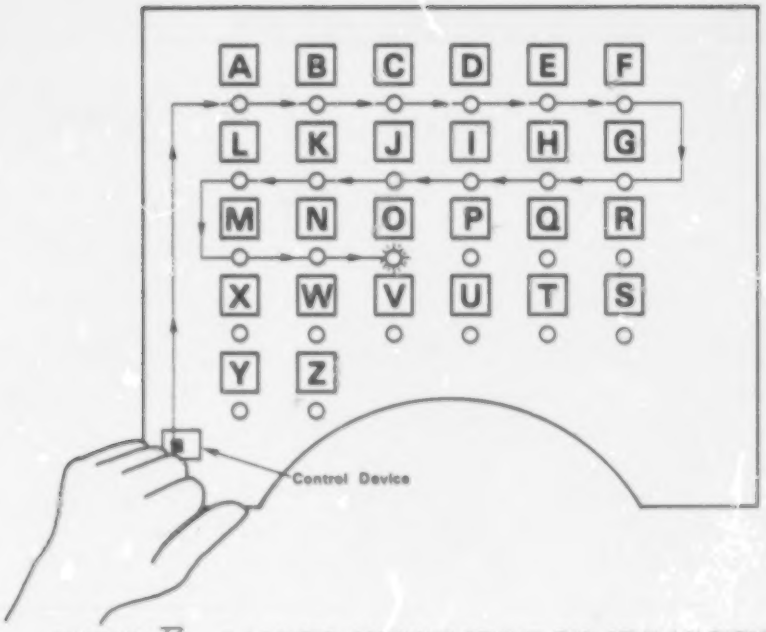

DIAGRAM 33: A LIGHTED SCANNING DEVICE FOR ITEM SELECTION

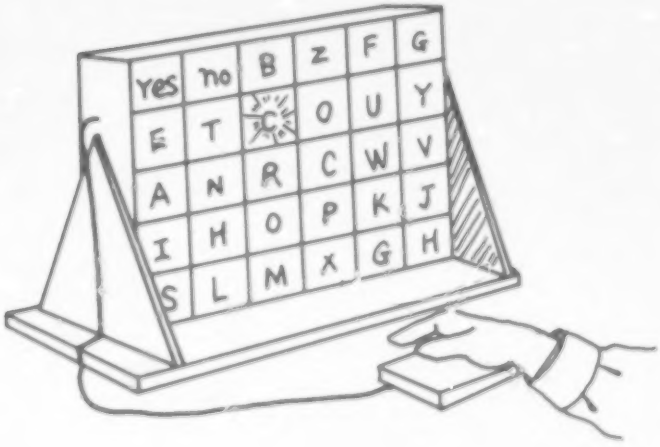

DIAGRAM 34: AN ALTERNATE LIGHTED SCANNING DEVICE
(Vanderheiden & Grilley, 1971)

DIAGRAM 35: THE ZYGO COMMUNICATOR (OR "ZYGOCOM"), A COMMERCIALLY AVAILABLE SCANNING DEVICE

Note: Manufactured by Everest and Jennings Co. Standard Model is approximately $345.00.

Items can be affixed to a translucent board such as plexiglass and the lighting apparatus (bulbs and wire) can be situated beneath the board. This method of construction may avoid breakage and may be more easily transportable.

--*flash scanning*: Flash scanning devices function similarly to a slide projector. Pictures are arranged in a revolving canister and are flashed individually, as slides are flashed by a projector. A control button (or switch) causes the canister to turn and a picture to pop up. A second press of the button drops the original picture and turns the canister to pop up a second picture, and so on. As in a slide projector, the pictures can be flashed at a fast pace or with a delay between each picture presentation. Diagram 36, below, illustrates a flash scanning device.

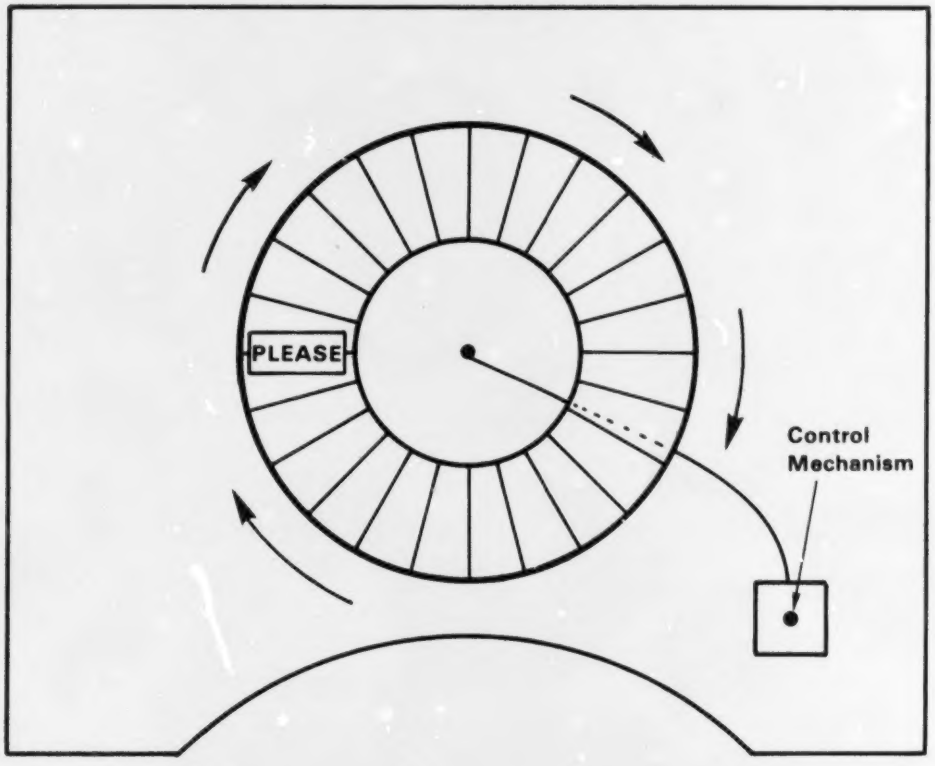

DIAGRAM 36: A FLASH SCANNING DEVICE FOR ITEM SELECTION

Flash scanning does not have to be used with a circular canister; row canisters can be used with equal efficiency. Also, more than one canister can be utilized for a communication board.

Remarks Regarding Scanning Devices: Scanning techniques are excellent communication devices for the cerebral palsied because they do not require a great deal of voluntary movement. However, the physical skills that are required by most scanning devices, particularly mechanical ones, are of a refined nature. That is, very discrete movements of the fingers may be required to control these devices. Modifications in the triggering mechanism may include enlarging the area of the button, switch, etc., or spacing these controls far apart. Pointing devices previously discussed, such as head sticks or mouth sticks, may also be used to control mechanical devices for those who have poor manual skills. An additional positive characteristic of a scanning device is that it is generally a quick and efficient method of communication.

Many mechanical devices can be purchased from manufacturing agencies. For information on the various devices available for purchase, the reader is referred to the text Non-Vocal Communication Techniques and Aides for the Severely Physically Handicapped, edited by Vanderheiden and Grilley.

Coding Devices. As defined by Vanderheiden and Grilley, this form of nonverbal communication is based upon a predetermined code that "must be either memorized or looked up on a chart." Following are examples of coding techniques.

In the case of the "yes/no" scanning techniques many simple codes can be applied. A movement of the head, a blink of the eyes, a buzzer signal or a hand movement are examples of codes to convey messages. As these are simple codes they can usually be memorized easily.

Another example of a coding device is a display of items in the form of a grid on the communication board, as depicted on the next page (See Diagram 37). Each row can be identified by a number heading and each column by a letter heading. Each item in the grid can thus be identified by a set of coordinates ("1 - B," for example). In front of the user is a list of numbers and letters which he must choose from to indicate the corresponding coordinates on the grid.

This type of coding device can be modified in many ways. For example, a row of numbers can be placed directly in front of the user and a list of words can be displayed on the board, each with a number or pair of numbers beside it. The user can indicate the word he wishes to express on the list by identifying its corresponding number in the square in front of him. This type of communication device is illustrated in Diagram 38.

Combination Techniques. Any of the communication techniques previously described can be combined as a single unit on a communication board. Following is an example of a combination technique using both scanning and coding. Diagram 39 on page 104 depicts a nonverbal communication technique based on a circular scanning method of expression. In addition, each vocabulary item has been given a code. The user must scan for the desired coded item which is identified by the list displayed on the board. The advantage in using this combination technique is that an unlimited number of items can be expressed by forming a two digit number

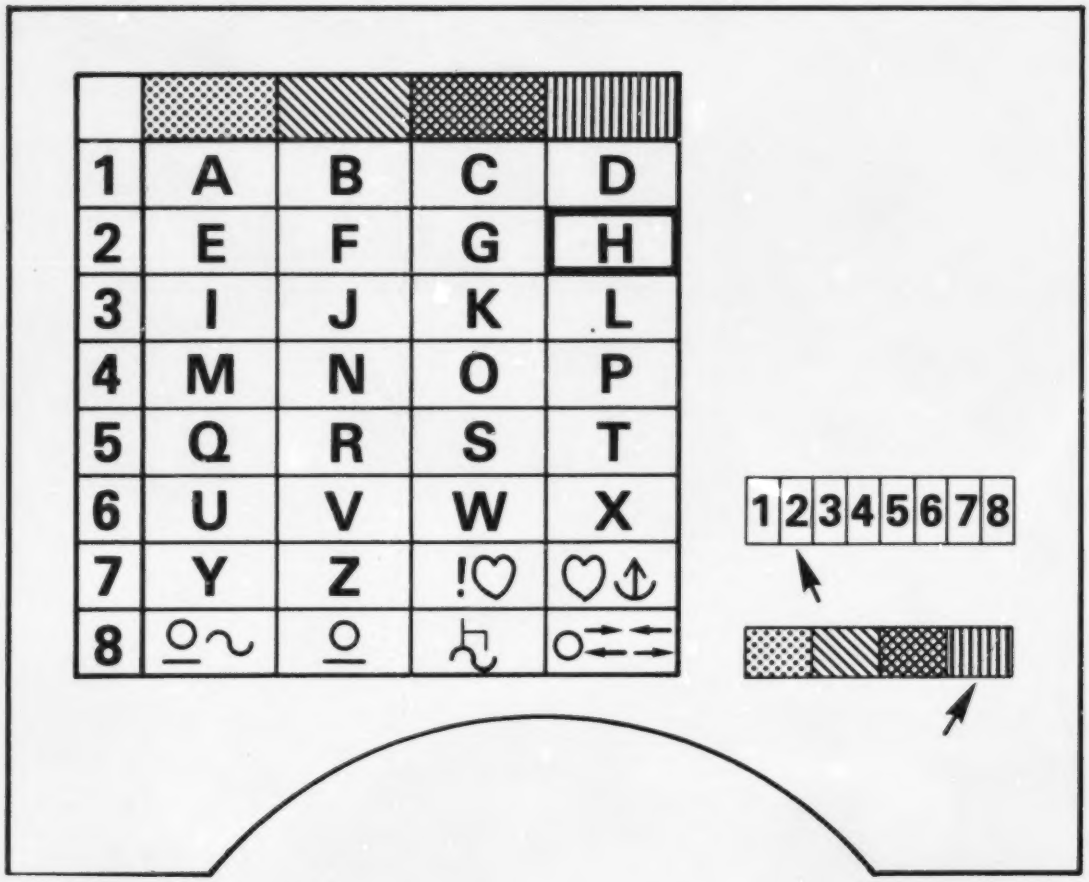

DIAGRAM 37: A CODED COMMUNICATION DEVICE

Note: This device requires selection of a horizontal and a vertical coordinate for item selection. This device utilizes numbers as vertical coordinates and graphic designs as horizontal coordinates, with the ultimate response being a spelled word. (A variety of responses other than spelling can be incorporated.)

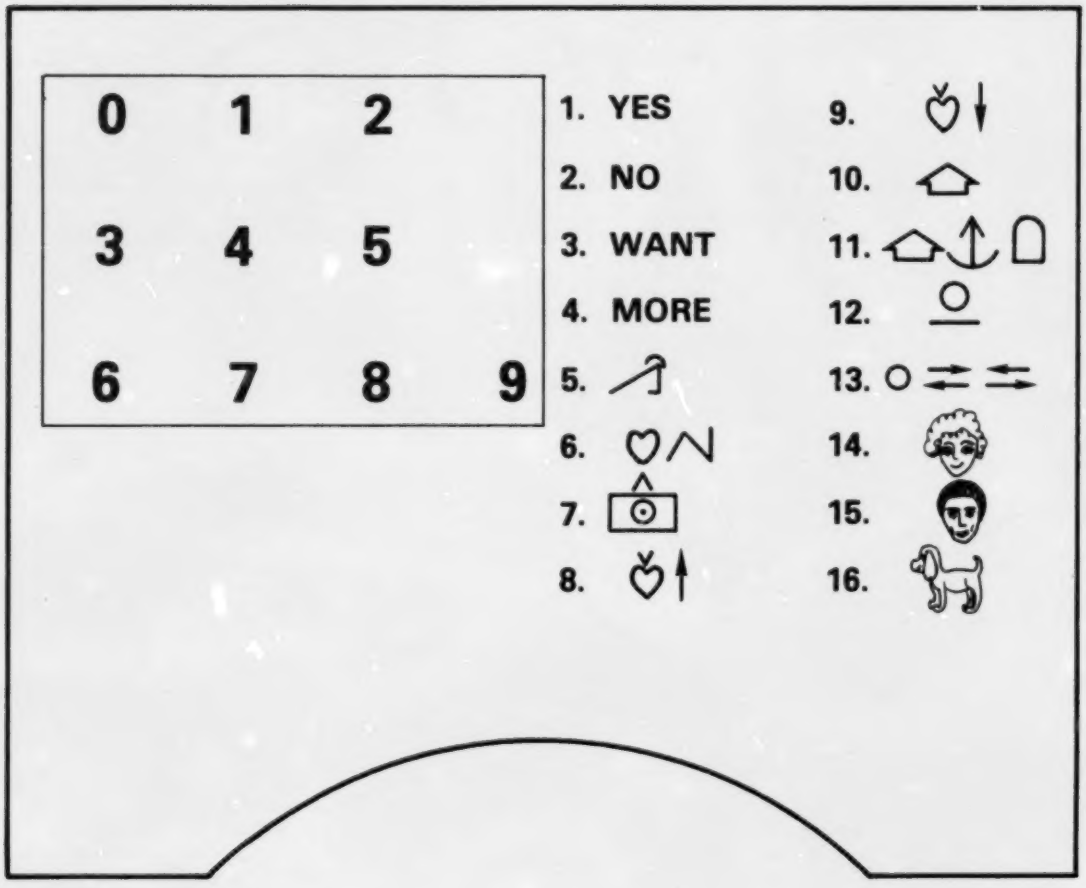

DIAGRAM 38: AN ALTERNATE TYPE OF CODING DEVICE

Note: The message selected is actually a code and must be interpreted according to the key at the right of the board. Note that with the board illustrated above an unlimited number of messages may be expressed by simply coding them according to 1, 2, or even 3 digit numbers.

code with the circular scanner. For example, scanning to the number 1 and then the number 0 forms the coded number 10, which will stand for a word on the accompanying list (See Diagram 39).

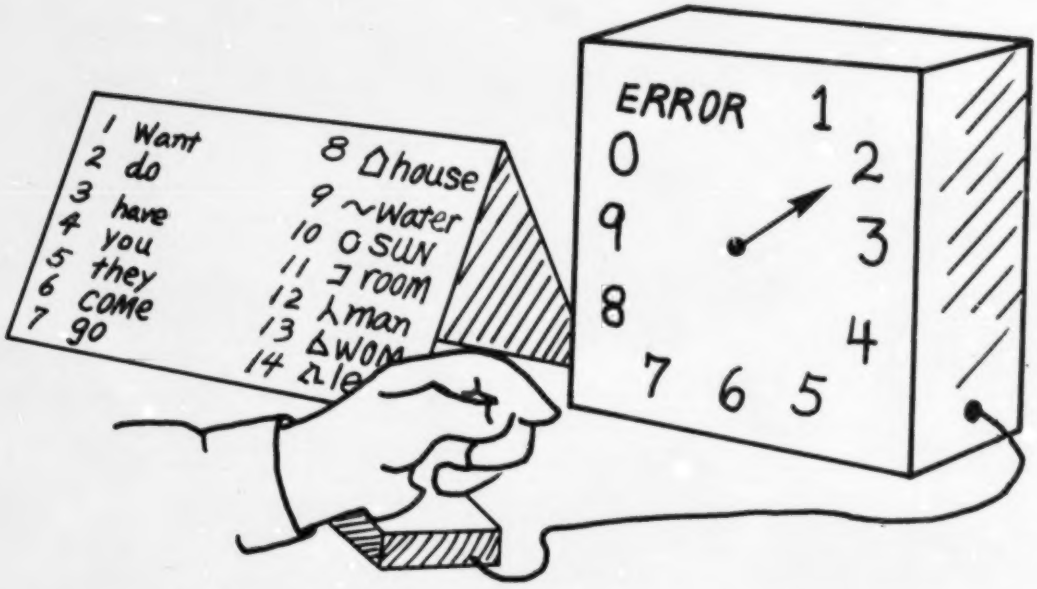

DIAGRAM 39: COMBINATION SCANNING AND CODING DEVICE

Note: The user controls this device as he would a circular scanner.

Factors to Consider Regarding Communication Boards. Each cerebral palsied individual is just that--an individual--with his or her own particular strengths and weaknesses. Thus, each communication board, must, in some way, be adapted to meet certain individual needs. It is for this reason that one does not simply prepare or purchase a board without making necessary adjustments. There are several important factors to take into consideration regarding aspects of the board itself as well as general guidelines for modification.

Size: The size of a communication board will depend upon 1) the amount of items to be placed on it; 2) the location of items on the board; 3) the user's range of motion over the board and 4) the size of the wheelchair or table to which the board is fitted.

In many cases, beginner boards become too small to accommodate the growing number of items that the user is learning to express. Rather than replace the original board, extensions can be attached to the sides of the board and secured by hinges. In this way, the extensions can fold over for ease of transportation.

Additional room on the board can also be made by drilling small holes at one edge of it and placing loose leaf rings in the holes. Using small plates of plywood or plastic, holes can be drilled to match the separation width of the rings and as many as fifteen or twenty additional plates can be attached through the rings. By flipping the plates over, the user can have access to many more vocabulary items than could be accommodated by the area of the board alone. Diagram 40 illustrates this type of modification.

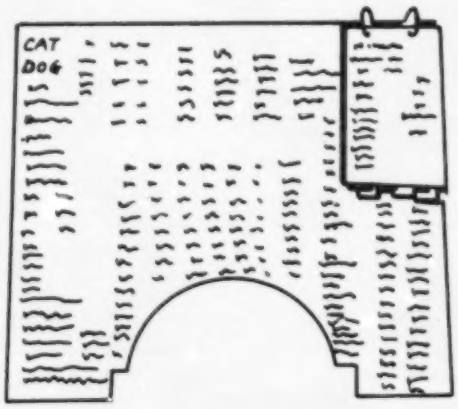

DIAGRAM 40: A COMMUNICATION BOARD WITH FLIP CARDS

Note: Increased space for items on a communication board may be achieved by attaching plates for additional items at the upper right hand corner. The plates can be flipped with ease by inserting tabs commonly used for loose leaf dividers.

Shape: Most communication boards are square in shape. However, there are no hard and fast rules as to the shape of a board. If an individual has a preference to one side or is stronger on one side of his body, the length of the board can be extended on that side to accommodate more vocabulary items that can be reached. Similarly, boards can be shaped to be long and narrow or wide and thin to accommodate certain physical capabilities or weaknesses. Boards can have rounded edges, be triangular or rectangular in shape or even be "L" shaped. The shape of the board, again, will depend upon the number and necessary location of items as well as the user's range of motion. Diagram 28 (page 92) depicts a board with an extension to the right.

Angle: It is convenient to position boards so that they lie on a flat plane in front of the user. This does not necessarily have to be the case--again, there are no hard and fast rules as to the angle of the board. Many cerebral palsied individuals accommodate better to boards at a 45^{0} angle in front of them. This angle is especially convenient for those using the eye localization response, head stick, or mouth stick.

Item Placement: The placement of items on a communication board should be carefully evaluated. Items considered to be most important may be affixed at areas providing the greatest ease of selection. However, as mentioned previously, placement of important items at a slightly challenging distance from the user may help to improve his range of motion. Secondly, enough space should be left between each item to allow for clear and precise selection of items. This is particularly important if a pointing or eye localization response is used. It is a good idea to make the items on the board easily removable, as they may need to be relocated or exchanged for alternate items in the future. Some have utilized magnetic materials for this purpose.

COMMUNICATION BOOKS AND OTHER PORTABLE DEVICES

The term "communication book" implies the structure of this nonverbal technique. It is used in a similar manner as a communication board except that the items to be expressed (pictures, words, etc.) are displayed within a book rather than on a board.

A loose leaf binder is the most convenient type of communication book because the pages inside can be removed, added or replaced easily. Pages made out of paper present problems for most cerebral palsied individuals because of difficulty in grasping each page individually, and they frequently tear or become frayed. Plates which are laminated or made of plywood (or other sturdy materials) are recommended as a substitute for paper; they can be fitted into a loose leaf binder in a similar way that plates are attached to communication boards, as described in a previous section. That is, holes can be drilled in the plates so that they fit the rings of the notebook. Items which are affixed to the plates should be covered by a clear protective sheet such as contact paper, to prevent damage and excessive wear. Diagram 41, on the next page, depicts a durable communication book.

Items placed in a communication book usually consist of pictures, words or other written symbols (which will be discussed more fully in the next section of the chapter). Methods for indicating items in a communication book parallel many of the methods described for communication boards. Eye localization, hand pointing, head sticks, light selectors, mouth sticks, yes/no scanning responses and coded systems are all appropriate means of selection for items in the communication book. A combined nonverbal system utilizing a communication board and a communication book can also be developed. The diagram, on a subsequent page, illustrates a communication board with grids containing coded items that can be interpreted by looking up the code's translation in the communication book (See Diagram 42).

There are many advantages to using a communication book. For an ambulatory individual, ease of transportation is of prime importance. Communication books can be hand carried, carried in a satchel or attached to an article of clothing, such as a belt. In addition to ease of transportation, communication books can often accommodate many vocabulary items for those with a more fully developed vocabulary.

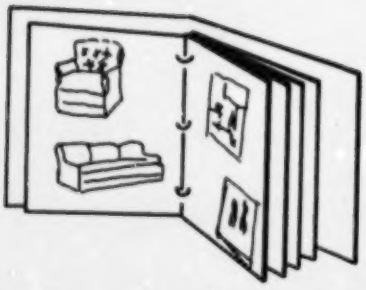

DIAGRAM 41: A STURDY PICTURE COMMUNICATION BOOK WITH PLATES MADE OF PLYWOOD

DIAGRAM 42: A COMBINATION COMMUNICATION BOOK AND COMMUNICATION BOARD

Note: The book is attached to an upright board which can be situated on a table or a lap tray. The board depicts grids containing coded items at either side of the book, and the book is used for interpretation of the codes. Vanderheiden & Grilley, 1971.

When the use of a communication book is found to be inappropriate, other varieties of portable devices should be considered. A single piece of plywood with items for nonverbal communication affixed to it may suffice. This can be hand carried, attached to an article of clothing or worn around the neck. If the individual is able to write he can be provided with a tablet and pen to carry with him at all times. An alternative to these methods is to carry a prerecorded cassette containing messages, along with a portable cassette recorder.

COMMERCIALLY PREPARED COMMUNICATION DEVICES

In recent years, commercial manufacturers have begun to create and market communication devices and aides.* Such items may range from simple, handy pieces of equipment, such as pointing assistors, to sophisticated electronic devices that provide complete independence in communication. Many of the devices described under the section on Communication Boards have been made available for purchase through various manufacturing agencies. These include head stick pointers, mouth stick pointers, light selectors, "yes/no" response indicators, electronic light scanners, coded systems, and even the communication boards themselves. With advanced technology, specialized typewritters are manufactured with modified key boards and/or computerized programs for feeding out information. Even more new and innovative devices are currently under development.

Two important drawbacks to purchasing ready made equipment as opposed to assembling the equipment ourselves are the costs involved and the likely chance that structural modifications will have to be made anyway. Products available for purchase may range in price from approximately $10.00 to $5,000.00--most costs tend to fall anywhere from $100.00 to $1500.00. It may be possible in certain circumstances, or through certain manufacturers, to order equipment that is tailor-made. However, the expense of such an item would probably be much higher than its original price.

There are literally hundreds of communication devices on the market today and it would not be feasible to mention them within this chapter. Many are described fully in the resource guide, Communication Resources for the Developmentally Disabled: A Guide for Parents, Paraprofessionals and Professionals, which was developed along with this manual and is available from the Job Development Laboratory of the George Washington University. The reader is referred to this guide for more extensive information concerning commercially available materials.

PART III: SYMBOLS FOR EXPRESSING INFORMATION VIA NONVERBAL SYSTEMS

SYMBOLS OF LANGUAGE EXPRESSION

Thus far, the contents within this chapter have alluded to nonverbal vocabulary items. We will now look at the various items that can be placed on communication boards and in communication books or are within the scope of commercially available devices.

*Note: A list of available resources is found at the end of this chapter.

PICTURES

Pictures are often used for communication boards or books to represent an individual's expressive vocabulary. For example, persons wanting to express the need to go to the bathroom, to get a drink of water or to go to bed would have pictures of a bathroom, a water fountain and a bed or bedroom affixed to their communication device. Actual photographs are an excellent starting point for those who have had limited exposure to pictures. There are many advantages to using photographs as opposed to illustrated pictures. Photographs, as exact replications of people or objects, are easily recognizable. Photos also depict people and objects for which there are no replications, such as family members, friends, pets and personal items. In addition, actual photographs usually make for an attractive communication device which is a motivational factor in and of itself.

Diagram 43 is an illustration of a picture communication board (See next page). Notice that short phrases or words are placed below each picture to convey special intended meanings. Notice also that these boards can range in complexity from very simple communication devices to more elaborate devices with a larger expressive vocabulary.

WORDS AND PHRASES

Printed words or phrases can be used instead of pictures for those at or above a word reading level. The advantages of using printed material are numerous. It is much easier to prepare a communication device with words rather than pictures. Also, words and phrases can be applied not only to communication books or boards but to various electronic print-out devices that are not used with pictures. Words and phrases can be arranged in various ways so that they can be combined by the user to express entire sentences. Written items also take less room than do pictures--this is an important factor to consider for those with extensive vocabularies. In addition, written words can express feelings, emotions and other intangible ideas that are difficult to represent in pictures. Diagram 40 (page 105) depicts a communication board affixed with a word vocabulary. Notice that the words are arranged in columns according to grammatic category, with nouns, verbs, adjectives etc... situated such that it is easy for the user to point to the words successively in order to produce an entire sentence.

ALPHABET LETTERS

Many individuals in need of nonverbal devices can read as well as spell words. In this case, all that is required is a nonverbal device which either prints out letters to form words and sentences or one which depicts letters that can be linked to form words. For example, portable typewriters with special modifications would be appropriate for this type of individual. If typing is impossible, other methods of letter selection can be utilized for use with a nonverbal device such as a communication board or book. Alphabet letter devices are very advantageous because they are not limited by a finite set of vocabulary items--as many words can be expressed as the user is able to spell. Alphabet letter devices are also simple to design and easy to prepare.

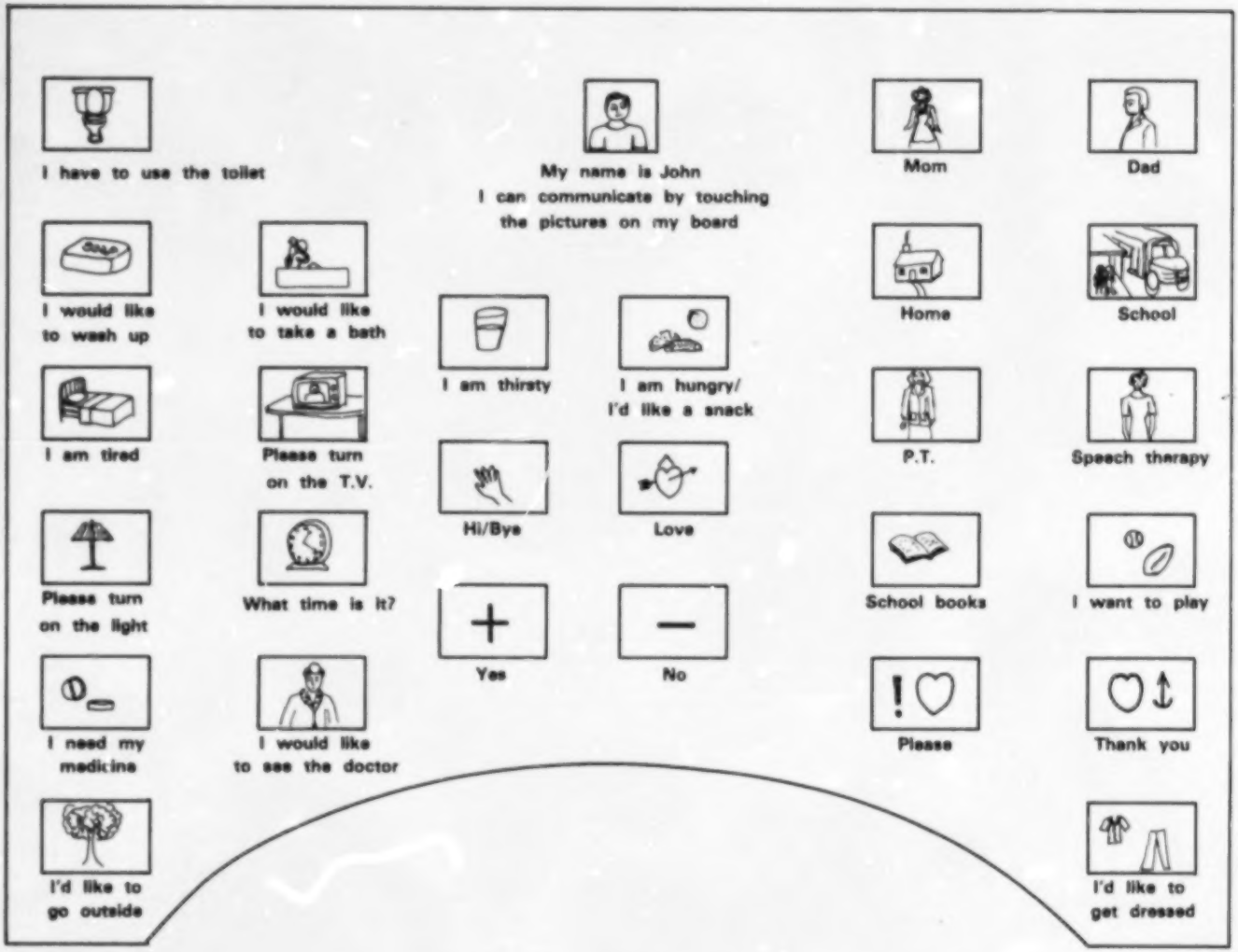

DIAGRAM 43: A PICTURE COMMUNICATION BOARD

BLISS SYMBOLICS

Bliss symbolics is a relatively new and innovative language system in which ideas are represented by written symbols unlike letters or pictures. Bliss symbolics differ from pictures because the symbols do not have to resemble the objects they represent. The system differs from written words because each symbol is "read" according to the idea it represents rather than letters to form words. It is actually similar to a form of heiroglyphics. The use of Bliss symbolics would be appropriate for individuals above a level of using pictures to communicate but not yet at a spelling or reading level.

Below are illustrations of Bliss symbols (See Diagram 44). Notice that each symbol has a corresponding word written under it so that the listener does not have to be familiar with the Bliss system in order to communicate with an individual using it. There are currently over 500 Bliss symbols. For further information on Bliss symbolics, the reader is referred to the Ontario Crippled Children's Cente., 350 Rumsey Road, Toronto, Ontario, Canada M4G 1R8.

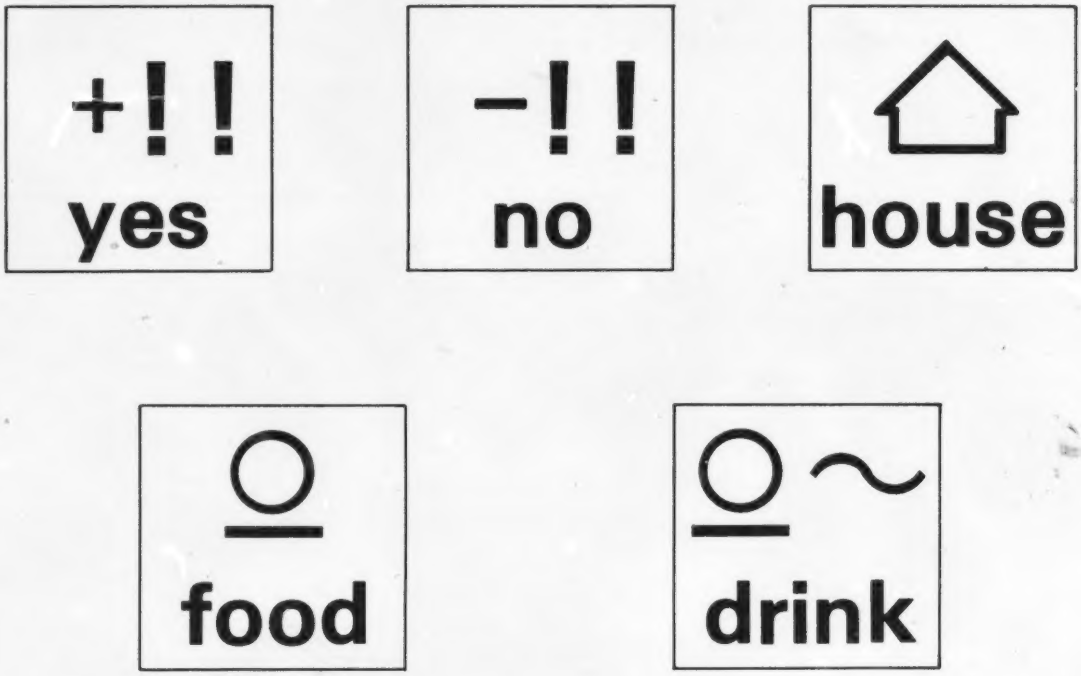

DIAGRAM 44: BLISS SYMBOLS

CHOOSING, PREPARING AND TEACHING NONVERBAL SYMBOLS

Choosing Items. Items must be chosen in accordance with the level on which the user is functioning. The specific type of item (picture, word, etc.) should not be difficult for the user to understand and relate to, nor should it be at a level too low and unchallenging. In either of these cases, the nonverbal device will not be motivational and will probably not be used successfully, if at all. Vocabulary items must be selected carefully in relation to the needs and likes of the user. After all, this is his or her communication device. The number of items to be expressed must also be considered--too much or too little will often lead to poor use of the device.

Preparing Items. Each item to be displayed--whether it be a picture, symbol, word, letter or typewriter key--must be prepared according to specific physical dimensions. The most important physical properties of the display items will be their size, boldness and level of complexity. Size and boldness will mostly depend upon the visual acuity of the user. Level of complexity, for example, elaborate versus simple line drawings, script versus printed letters, etc., will depend upon the level of the individual.

Teaching Items. Be sure that the user has learned to identify and discriminate each item before it is placed on the board. This is important for two reasons. First, it is believed that comprehension--the understanding of an idea or concept--must be established before that concept can be expressed. For example, we must understand what the word "sincere" means before we can apply that description to an individual. Applying this theory to programs in nonverbal communication, one must be sure that the student understands the meanings intended by his pictures, Bliss symbols, etc. before he is required to use them expressively. Second, some individuals become so well acquainted with the position of items on the nonverbal device that they lose sight of the meanings of these items. By placing an item on the board before it is fully comprehended, the user may be identifying it by position without considering the meaning behind it. In other words, he may be communicating without realizing what he is communicating. It is often helpful to intermittently change the position of items on the device so that the user concentrates more on what is being expressed rather than how it is expressed. In analogy, many people simply like to hear themselves talk without paying mucn attention to what they are saying. We don't want our nonverbal children to fall into this type of pattern.

Changing items from time to time also gives the user variety and expands language potentials. Communication devices often take on a "permanence" about them. This should never be the case. A communication device should change as its user changes--a device that always stays the same tells us something about the individual using it.

SIGN LANGUAGE

Sign language originated several hundred years ago when it was realized that deaf or hearing impaired persons could communicate using a system of hand gestures. Since then sign language has grown tremendously in scope and has become an integral part of the lives of a great many deaf people. Until recent years, sign language was considered to be a system to be used only by the hearing impaired

or deaf. Although still universally accepted as "the language of the deaf," it is now realized that the possible uses of sign language are more extensive. Recent trends in nonverbal communication for the physically disabled are emphasizing sign language as a possible form of nonverbal communication.

Sign language is certainly an avenue to consider when planning a nonverbal program for a cerebral palsied person. However, an important factor to consider is whether or not the individual has enough fine motor control to shape his fingers and hands into manual signs. Many cerebral palsied individuals lack the fine motor control for performing *conventional* manual signs. Therefore, modifications may need to be made. A recent study, published by Laurel Duffy of the University of Nevada, investigated the possibility that severely handicapped cerebral palsied children could learn to communicate through an *innovative* sign system. The special sign language that Ms. Duffy invented consisted of gross motor movements--as opposed to fine motor movements--combined with vocalizations that the students were already capable of producing. It was felt that this system would be "easier to learn and to remember than the presently used sign language systems for the deaf." The results of this study conclusively supported the use of such a sign language system with the cerebral palsied. Below are examples of several of her signs. For further information, the reader may write to:

Department of Special Education
University of Nevada, Las Vegas
4505 Maryland Parkway, South
Las Vegas, Nevada 89154

"CUP"	*MAKE A FIST, RAISE IT UP TO THE MOUTH AND THEN DOWN.*
"HURT"	*BOW HEAD AND SAY "OH."*
"MORE"	*MAKE A FIST, TAP RIGHT WHEELCHAIR ARM TWICE AND SAY "MMM."*
"PANTS"	*PLACE BOTH HANDS ON KNEES AND RUB UP AND DOWN.*
"SHOES"	*SHAKE BOTH FEET AND SAY "OOO."*
"STOP"	*EXTEND HANDS WITH PALMS FORWARD.*
"WANT"	*TOUCH CHEST WITH ONE HAND, THEN TOUCH HANDS TOGETHER.*

DIAGRAM 45: EXAMPLES OF MANUAL SIGN LANGUAGE DESIGNED BY LAUREL DUFFY

Notice that vocalizations often are incorporated in the production of these signs.

Another consideration in developing a sign language program is that the user must grasp the concept of using a language expressed through manual symbols. This brings up an important point. Many systems of sign language have come into existence. These systems differ from each other in their degree of complexity. A signing system known as "Signing Exact English" (or "SEE"), is more complex than most other systems because it involves translating English into a sign language

word-for-word. In comparison, the system of "American Sign Language" or "Ameslan" is relatively simple in structure. It involves communicating basic *thoughts* rather than complex sentences. Below is an example of the difference between the two systems.

English Sentence:	*The man wants to go to the store.*
Translation in "SEE":	*The man wants to go to the store.*
Translation in "Ameslan":	*Man want go store.*

There are a number of signing systems at intermediate levels of complexity. The reader is referred to Gallaudet College, 7th and Florida Avenue N.E., Washington, D.C. for further information concerning the various types of signing systems used by deaf people today. It is important to consider all of the alternatives so that you can find the one most suitable for your child and apply it to your specific program.

An additional consideration in implementing a sign language program with a cerebral palsied or any other handicapped person is that the manual symbols must be understood by the receiver of the message in order for the system to be effective. In many cases, this involves teaching the system to all persons in the student's environment. However, it may be possible for a student to carry a diagrammatic key illustrating and explaning his signs.

PART IV: EVALUATION TECHNIQUES FOR NONVERBAL COMMUNICATION

A careful and broad evaluation of an individual must be conducted before a nonverbal system of communication can be developed. The evaluation should be comprised of methods for assessing the most efficient *means of communication* for that individual as well as the most appropriate *types of symbols* for nonverbal expression. Therefore, evaluation techniques will be classified according to 1) skills to determine the form of communication and 2) skills to determine the content of communication.

A speech pathologist should play a major role in conducting the evaluation and interpreting the results. However, there are many important skills to which parents and teachers should be alert.

DETERMINING FORM OF COMMUNICATION

Physical Strengths and Weaknesses. Hearing and vision should be evaluated by a professional examiner before a nonverbal technique is developed. Weakness in either of these areas will highly affect the form of the communication device.

Motor control is another important factor to consider. Since the types of nonverbal systems previously discussed involve some sort of physical movement, all aspects of voluntary control should be carefully evaluated. A physical and/or occupational therapist should conduct an examination of motor development. Important skills to identify include head control, arm control, hand and finger control, range of motion of the arms, sidedness and eye-hand coordination. Position should be considered in terms of whether the individual is ambulatory or wheelchair bound.

If in a wheelchair, a comfortable and appropriate sitting posture is of utmost importance (See Chapter 1). Availability of resources must be considered in determining if equipment is to be self-constructed or purchased.

DETERMINING CONTENT OF COMMUNICATION

The ideas that are chosen to be expressed through nonverbal communication, and the symbols chosen to represent these ideas, will be determined by three important considerations: 1) language development, 2) intellectual abilities and 3) educational background.

The individual's level of language development will determine the ideas that he is capable of expressing, as well as the level of complexity in his expression of these ideas. The child at a two year level of language development is concerned mostly about himself, his well-being and the activities and people around him. These ideas will be expressed in a relatively concrete way, in short utterances of one to three words that basically get the message across, such as "more cookie," "there daddy" and "no more toy." The individual at a six year level of language development will be concerned with the well-being of others and with events that may have no direct bearing on his well-being. This child will use more complex forms of expression, such as "Jimmy wants to go outside" or "Daddy is working hard." Therefore, a careful study of the individual's language development will yield important information about the thoughts he will need to express and the length and level of complexity that his expressions will take.

Language development and intellectual ability are closely related in that a person who is functioning below normal intelligence levels will also be delayed in language development and may never achieve a language level concurrent with his chronological age.

The educational skills which the individual has attained will determine the type of symbols that are to be incorporated within the system. If he is at a preschool level, the symbols for his communication device should be simple pictures that directly get the message across. If he is at a pre-reading level, Bliss symbols may be appropriate. Persons at reading and/or spelling levels will probably be most comfortable with written words, phrases or sentences, alphabet letters, or a combination of the three.

ADDITIONAL FACTORS TO CONSIDER

The degree of parental involvement in the program is of prime importance to its success. Many nonverbal systems rely on carryover in the home. Therefore, parents must be willing to invest time, effort, patience and understanding in order for a nonverbal program to be truly effective.

Last, and most important, we must consider the personal attributes of the individual. A professor in college taught us an extremely valuable lesson. She used to say, "The person with a disability has a problem, but more importantly, the problem has a person." In working with the disabled our first and foremost consideration must be whether we are helping the person, not just the disability. What could please us more than that first attempt at communicating? Probably just one thing--that first <u>real</u> smile.

REFERENCES

1. Lois Bloom, Language Development: Form and Function in Emerging Grammars, The Massachusetts Institute of Technology, C 1970.

2. Laurel Duffy, An Innovative Approach to the Development of Communication Skills for Severely Speech Handicapped Cerebral Palsied Children (Master's Thesis), C 1977.

3. Lyle L. Lloyd, Communication Assessment and Intervention Strategies, Baltimore: University Park Press, C 1976.

4. Gregg Vanderheiden & Kate Grilley (Eds.), Non-Vocal Communication Techniques and Aides for the Severely Physically Handicapped, Baltimore: University Park Press.

5. Beverly Vicker, Non-Oral Communication Systems Project, 1964/1973, Iowa City, Iowa: University of Iowa, 1974.

COMMERCIAL MANUFACTURERS OF NONVERBAL COMMUNICATION DEVICES

Adaptive Therapeutic Systems, Inc.
162 Ridge Road
Madison, CT 06443

Bell Telephone Lab
Information and Publication Division
600 Mountain Avenue
Murray Hill, NJ 07974

Center Industries
Allambie Road
Allambie Heights, New South Wales
Australia

The Herald Company
2163 Marsh Avenue
Pittsburg, CA 94565

Ulf Lekemo
Rikscentralen
Brache Ostergard S 417 22

Phapco Society
49 Commerce Building
University of Saskatchewan
Saskatoon, Saskatchewan

Possum, Inc.
P.O. Box 4424
Anaheim, CA 92803

Prentke Romich Company
R.D. 2 Box 191
Shreve, OH 44676

Fred Sammons, Inc.
Box 32
Brookfield, IL 60513

Don Selwyn
National Institute for Rehabilitation Engineering
Pampton Lakes, NJ 07442

Telephone Pioneers of America, Miniature Chapter
Manitoba Telephone System
489 Empress Street, Rim Bay
Winnipeg, Manitoba R3CBA 2 Canada

Trace Center
922 ERB 1500 Johnson Drive
University of Wisconsin - Madison
Madison, WI 53706

Typewriting Institute for the Handicapped
3102 West Augusta Avenue
Phoenix, AZ 85021

Zygo Industries
Box 1008
Portland, OR 97207

Note: This list of resources was abstracted from Chapter 3 of the text Communication Resources for the Developmentally Disabled, compiled by the Job Development Laboratory of the George Washington University, Department of Rehabilitation Medicine.

APPENDIX

NORMAL DEVELOPMENT - BIRTH TO ONE YEAR

Note: Ages given are averages. Some skills may be acquired earlier by some babies and later by others. A range of several months may still be within normal limits for some of the later speech skills.

Approximate Age	
Birth - 1 mo.	Poor lip closure at corners of mouth causes dribbling. Sucking and swallowing are reflexive. Bite and gag reflexes are present. Breathing is through mouth. Cries of discomfort and suckling sounds are made. Eyes do not focus and their movements are uncoordinated. Hands are predominantly in fists. Limbs move randomly. Body positions are controlled by reflexes.
1 mo.	Lip closure has improved. Oral reflexes are still present. Cooing and gurgling appear in addition to crying. Smiling may begin to appear. Objects are watched in line vision only. Grasp reflex of the hand with an involuntary release is present. Asymmetrical positions are most common and are controlled by reflexes. Head sags in supported sitting and whole back is rounded.
2 mo.	Oral reflexes are still present. Often looks at speaker and reponds with smiling and "happy sounds." Some syllables are repeated when cooing and babbling. Objects are held briefly. Extended hand is regarded. Can visually track an object to midline, eyes focusing. Head is kept mostly in midline and can be momentarily lifted. Head bobs in supported sitting.
3 mo.	More mouth muscles are used in sucking. Frequent choking. Gag reflex present. Lots of drooling. Looks directly at a speaker, frequently watching the mouth. Sometimes responds to speech by vocalizing. Often vocalizes with two or more different syllables. Glances at rattle in hand. Can follow a moving object 180° both vertically and horizontally. Hands are predominantly open. Can lift head for longer periods. Can briefly bear some weight on legs when supported.
4 mo.	Biting reflex weakens. Food beginning to be transferred voluntarily from front to back of mouth. Turns head to source of voice. Is disturbed by angry voices. Laughs when playing with objects. Babbling and using sounds made with the lips such as "m," "p," and "b." Will reach out both arms to an object and will bring hands and object to mouth. Can lift and hold head up higher and longer.

4 mo. (Cont'd) Will prop self up on forearms with one arm extended. Slight head lag when pulled to sitting. Head is steady but forward when supported in sitting and only lower back is curved.

5 mo. Suck-swallow and other mouth reflexes are weakening and will soon be inhibited. Chewing improves. Can accurately find source of voice and will stop crying when spoken to. Using more and different consonant sounds and may produce four or more different syllables at one time. More variation of vocal rhythm and intonation. Is playing with toes and smiling at a mirror. Can prop up on hands with extended arms. Can roll from back to stomach. No head lag when pulled to sitting. Head is erect and steady in supported sitting and back is straight.

6 mo. Teething. Can chew solid foods such as fruit and cookies. Can swallow small lumps. Tongue mobility improving. Recognizes own name. Sometimes responds to name by vocalizing. Is responding to some words with gestures such as "come," "bye-bye," "up." Repeats combinations of two or more different sounds, such as "baba," "nana" and sometimes seems to use "words" in own baby talk. Understands "NO!" Watches moving objects and hands follow (beginning visual-motor coordination). Holds bottle. Can prop self on one hand and reach with other. Rolls from stomach to back. Can sit erect in a chair.

7 mo. Begins to recognize family member's names. Begins to associate own babbling with consistent names: "mama," "dada." Makes distinct angry and hungry calling sounds. Grasps objects with one hand and can transfer to other hand. Will pat a mirror image. Pushes up briefly to hands and knees. Can lift head when lying on back. Supports self briefly in sitting. Bounces actively on legs when supported upright.

8 mo. Recognizes names of familiar objects. Stops playing when name is called. Long chains of babbling that may sound like sentences. Enjoys "talking and doing" games such as "peek-a-boo" and "pat-a-cake." Can secure small objects such as string. Sits unsteadily one minute and can assume sitting position from lying on stomach. Pulls to standing from kneeling and can maintain briefly when hands are held.

9 mo. Finger play in food, squeezing and smearing. Understands some simple requests. Is becoming interested in picture naming games. Uses gesture language such as shaking head and waving. Mimics sounds and speech rhythms used by others. Can sit steadily for ten minutes. Can stand holding onto rail. May "bunny hop" on heels.

10 mo. Seems to understand some simple questions such as, "Where is your diaper?" Moves approximately in time to music. Vocalizes using many patterns; may try to imitate some words. Beginning isolated finger movements; can use index finger to poke. Places object in

10 mo. (Cont'd) container. Sits steadily indefinitely. Pulls to feet holding onto rail. Creeps on hands and knees.

11-12 mo. "Talks" to toys, pets, people using speech-like sound combinations with occasional real words. May use three or more words consistently. Vocalizes along to favorite songs. Listens and responds to speech over longer periods of time. Responds to several verbal requests. Removes object from container. Lifts and replaces foot when standing. Walks holding onto rail. May walk on hands and feet.